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paratively small area occupied by Mounts Aroroy, Bagadilla, and Kalakbao. The summits of these hills lie in an almost direct north and south line, although the individual hills show a marked northwesterly trend. This trend is in a large measure due to the greater resistance to erosion offered by the quartz veins, which practically all show a northwesterly strike.

Mount Aroroy (elevation, 250 meters) shows this trend very clearly, in a long, cogon-covered point running out from the summit to the northwest. A large vein has been opened on the summit of the mountain and its continuation along the ridges is shown by bowlders of iron-stained quartz. Mount Bagadilla (elevation, 340 meters) shows two large ridges running off to the northwest, the southern certainly being due to the presence of quartz veins and the northern probably to the same cause. The veins of the southern ridge of Mount Bagadilla continue across the Guinobatan River and there form the backbone of Mount Kalakbao (elevation, 200 meters). Mount Kalakbao is a long ridge following the northwest strike of the veins. It contains at least ten veins, including the best known in the district. Only two veins have been found across Kaal Brook to the southeast, and apparently none continue farther southeast into Mount Vil-lon. It seems as if the northerly stretch of the Guinobatan River on the west and Mount Vil-lon on the east form the boundaries of the Aroroy vein system, a line southeast from the turn of the Guinobatan River at the Gold Bug property, and between Mount Kalakbao and Panique Hill bounding the system on the south.

The drainage features of the Aroroy district also show marked peculiarities. In the extreme north of the district the Buyuan River has a northerly course near its mouth, although farther up the stream the course is northwesterly. The two small streams near Aroroy, Ambulong and Lubigang Creeks flow northwesterly into the mangrove swamp which surrounds Aroroy, between narrow, northwesterly ridges. An unexplained feature of the course of Lubigang Creek is the sharp bend it makes into Mount Aroroy. There seems to be nothing in the structure of the rocks to account for this, nor does it seem probable that a northwesterly area of weakness would be developed for such a short distance.

Bangong Creek flows between Mount Aroroy and Mount Bagadilla, but cuts obliquely across the strike of the veins instead of running parallel, as would be the case with perfectly adjusted drainage. Another peculiarity of this stream is in its headwaters. It rises east of Mount Aroroy and flows at first to the southeast, draining country which would naturally be expected to be a part of the drainage basin of one of the creeks flowing toward Aroroy, or of the Buyuan River. It is evidently a capture of the headwaters of Balagting Creek, a stream flowing southwest, tributary to the Guinobatan River.

The Guinobatan River presents several peculiarities in its course, inexplicable except by the supposition of superimposed drainage. Rising to the east of Mount Vil-lon it flows alternately west-northwest and west. North of Mount Vil-lon it flows to the west with long, graded stretches and small rapids. At the junction with the Kaal there is a small fall and the course changes to nearly north with one sharp ox-bow, until it reaches the junction with Balagting Creek, where it turns sharply to the west and enters a deep canyon between Mounts Bagadilla and Kalakbao. This canyon, 2 kilometers long, cuts diagonally across almost the whole of the vein series. After a sharp turn to the southwest at the Gold Bug mine, the river flows north for 3 kilometers to its junction with Bangong Creek, where it turns to the west again and enters the mangrove swamps that surround the bay. On this northerly stretch the river again cuts diagonally across the trend of the veins, but here it is noteworthy that, while outcrops and bowlders show the presence of veins extending down to the river on the eastern bank, the hills to the west are entirely barren. This northern stretch is parallel to the bay and only a kilometer from it. Evidently there is a northerly element in the lineaments of this district, which, while less distinct than the northwestern and southwestern trends, shows in Port Barrera, the line of low hills on its eastern shore and the lower part of the Guinobatan.

The Lanang River also has a very peculiar course. Rising in the mountainous upland in the central part of the island, it enters the Aroroy district with a northwesterly course, then suddenly turns to the southwest and for 2 kilometers flows through a deep, narrow gorge, when it turns again at right angles and flows irregularly to the northwest for the same distance until it once more makes a sudden turn and takes a northeast course through a smaller, but similar gorge. From here on it flows to the north through a small flood plain until it enters the great mangrove swamp of the upper part of Port Barrera. Northwestward from the angle made by the river, on entering the upper gorge, a broad and rather flat valley is found between two ranges of hills. This valley would seem to be the natural course of the Lanang, and the sharp angle of the river and the small stream entering at this point suggest capture. However, there seems to be no reason why a stream having such a direct and regular course should be captured by one so unfavorably situated as is the present Lanang River. A possible explanation is that fissuring in a northeasterly direction has produced lines of weakness, allowing a stream leading in this direction an advantage over the more regular stream flowing northwest. The course of the river in the upper gorge, prolonged to the northeast, would be continued in the valley to the southwest of the hill forming the divide between the headwaters on

Panique Creek and various small tributaries of the Lanang, and would run along the northwestern flank of Mount Vil-lon. The headwaters of Panique Creek and Kaal Creek also form a northeasterly trough. It is quite probable that the cutting off of the vein series may be due to a fault along the northwestern side of Mount Vil-lon. Since the vein system is later than the andesite breccias, Mount Vil-lon can hardly be an intrusion of later date than the period of vein formation, and the vein series being regular rather than radiating, can not owe its origin to fractures formed around an intrusive mass.

In the westerly stretch of the Lanang, between the two gorges, is an abandoned meander of the river, its course having been shortened by lateral erosion on the convex sides of the two bends. The hill between the old and new courses is composed of a firm conglomerate of basalt pebbles, a common country rock of the surrounding region, and is about 50 meters above the river. The river must, therefore, have been at grade at least 50 meters above the present level, and this implies an uplift. Its course having been already determined for it, the cutting through of the lower gorge allowed the stretch above to remain at grade, and as the gorge was cut down its meander became entrenched and it could only have been in comparatively recent times that the river, being nearly at grade up to the upper gorge, cut through the neck of its old meander. The deserted meander is filled with old river gravels and furnishes promising dredging ground, as the Lanang and its tributaries cut the Mount Cogran vein and several as yet undeveloped veins to the west of Mount Cogran.

The course of the Lanang gives the impression that the present stream is the result of the union under peculiar circumstances of two streams flowing northwest, being a case where captures have tended to lengthen rather than simplify the course of the stream. The evidence of the streams in the Aroroy district seems to point to a period of elevation after the courses of the streams were in a large degree determined, followed by a period of considerable depression when deep bays were formed and the dark blue limestone found in the valley of the Guinobatan at 150 meters' elevation was deposited. Uplift followed, and during this period the readjustments of drainage of Balanting Creek and the Lanang region took place. Since then there seems again to have been some slight depression shown by the slight embayment at the mouths of rivers, and the extent of the mangrove swamps.

The growth of the mangrove swamps has played an important part in the formation of the land on this side of the bay. The mangrove tree must grow with its roots in the water, and the network of roots catches débris and soon builds up the land. As solid ground is built up, the inland trees die and the swamp keeps advancing seaward, building up the land as it goes. Lehnert[9] estimates for Borneo that under favorable circumstances land may be thus formed at the rate of 100 meters in forty to forty-five years. Near the mouth of the bay recent coral largely replaces the mangroves as an agency for upbuilding the land.

The movements of the western side of Port Barrera do not seem to have been synchronous with those of the Aroroy district. Probably during the greater part of the oscillations of the Aroroy region the opposite side of the bay was submerged and its uplift seems to have taken place contemporaneously with the depression of the opposite side. This independence of movement points to faulting along a line in the bay.

LANANG TO MANDAON.

Only a hurried reconnaissance was made southward from the Lanang Mining Company's camp on the Lanang River, and the country was studied in far less detail than the Aroroy district. Leaving the amphitheater formed by the deserted meander of the Lanang, the ground rises rather steeply to the south with hills composed of basalt, basaltic tuffs and conglomerate until Mount Nabongsuran is reached. This mountain is the highest between Mounts Vil-lon and Mandaon, probably reaching an elevation of over 300 meters, and has its long axis following the prevailing northwesterly trend. The small, triangular valley of Mandalidon is found at the foot of the mountain. The Mandalidon River flows northwest to Port Barrera and a small branch joins it here from the northeast. The two hills to the west of Mount Nabongsaran, Mount Masapinit and a smaller hill, both of conglomerate dipping to the southwest, show the northeasterly trend which now becomes the dominant feature of the country.

The hills trend to the northwest for 6 or 7 kilometers southward from the Mandalidon River. The Mabui River, where it is crossed by the trail, flows to the west, but soon turns and assumes a northwesterly course, where it flows through a broad valley, on the southwestern side of which a sharp escarpment of sedimentary rocks is encountered, showing several prominent benches. This escarpment extends to Pagbulungan Point, west of Mandaon, and is broken only by the two small canyons of the Butuan and Mombog Creeks. For about 8 kilometers this line of hills runs due south and then turns to the southwest for about 12 kilometers until it reaches Point Pagbulangan. Near this point it was found to consist of conglomerate, shale, and sandstone, evidently of marine rather than fluviatile origin, but in the northern part, as far as could be judged at a distance, there was a capping of limestone as well. This ridge forms the most prominent feature of the landscape of this region as it rises in sharp cliffs from the plain at its foot to a height of perhaps 200 meters above the plain. To the westward its slope is gradual.

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[9] Lehnert: Über Landbildungen im Sunda-Gebiet, *Deutscher Rundschau f. Geog. u. Stat.* (1882), 58. Quoted by Posewitz, Th., Borneo (English translation) London (1892), 257.

About 3 kilometers south of the Mabui River the land, which has been gradually rising from an elevation of 160 meters at the Mabui River to 240 at this point, suddenly falls off in a very steep slope to a broad, flat plain, having an average elevation of about 130 meters, the bounding escarpment running first to the southeast and then northeast. The plain is drained by two parallel streams, the Butuan and Mombog Rivers, which flow to the westward through the escarpment already described, although the principal branch of the Butuan has a southwest course parallel to the cliffs bounding the plain. The peculiarity of the courses of these rivers again suggests superposition. One would hardly expect to find two such deep, narrow canyons close together when more reasonable avenues for the drainage of the plain lie to the northwest around the end of the escarpment into the Mabui River or southwest into Nin Bay. A sharp pinnacle of limestone, Butuan Hill, stands in the center of the plain. This peak is flat-topped, rising in a sharp cliff about 70 meters above the plain; its base is elliptical, the axes being about 400 and 150 meters in length. The limestone has been largely dissolved and large caves have been formed. As several skeletons have been found in these places, it is evident that they once served for burial.

This limestone peak and the conglomerate to the west mark the present limit of a marine sedimentary series which extends northward to San Agustin and the western side of Port Barrera. The country south from the Lanang River, consisting of well-worn hills of volcanic and pyroclastic rock with occasional fluviatile sediments, clearly represents the old land upon which these sediments were laid down. That the sediments probably once covered a larger area is indicated by the peculiarities of the courses of the various streams, particularly the Lanang River and Butuan and Mombog Creeks. The present boundary of the series is well defined by a trough running northward from the Butuan plain to the head of Port Barrera. Possibly the escarpment bounding the plain on the north represents the old shore line and Butuan Peak is an isolated coral reef. Butuan plain itself drops off to the south in another escarpment similar to, although smaller, than the first. To the west the sedimentary escarpment, now turning off to the southwest, overlooks the plain, while on its eastern side the upper plain, 70 meters above, stretches away in a southeasterly cliff. In both the upper and lower plains the underlying rock is basalt, strongly magnetic. The lower plain is broken by numerous small hills and grades gently down from an elevation of about 40 meters to the mangrove swamps surrounding Port Mandaon.

NIN BAY.

The bay on which the little town of Mandaon is situated consists of three different bodies of water, Nin Bay, Loog Bay, and Port Mandaon. The outer of these, Nin Bay, has regular outlines and shoals off very evenly. At its head is a broad line of beach with lowland back of it. The town of Mandaon is at the southeast end of this. The water is very shallow along this beach and at low tide mud flats extend out for a considerable distance. Southwestward, following the long axis of the bay, the water shoals off very regularly at the rate of about 3 meters per kilometer. A line drawn across the entrance of the bay, from Pagbulungan Point to the eastern end of Puró Island, shows a fairly constant depth of about 17 meters and crosses the only shoals in the bay, Nin and Ochoa banks, which show a minimum depth of 3 meters. However, on the northwestern and southeastern sides of the bay, the water deepens much more rapidly, depths of over 15 meters being shown on the chart at distances of less than 500 meters from the two points, showing that the present shallowness of the bay is due to silting up from its head. The sedimentary escarpment already described extends along the northeast shore to Pagbulungan Point. A broken range of basalt hills exists to the southeast of the bay. The range, beginning at Mount Tuitong above Mandaon, extends through the Gapus Hills (elevation, 144 meters), Puró Island (elevation, 162 meters), and Kamasusu Island (elevation, 159 meters), being broken by deep channels between Mandaon and the Gapus Peninsula, and between Puró and Kamasusu Islands, a shallow channel being found between Puró Island and the mainland. The basalt is strongly magnetic, so much so that magnetic observations taken in 1895 for the center of Nin Bay showed an eastward declination of 3° 47′ instead of the normal eastward declination of less than one degree.

Loog Bay is south of Nin Bay and connected with it by the two inlets at the ends of Puró Island. Like its northern neighbor it has a northeasterly direction. Its maximum depth is 15 meters at the entrance, and it shoals rather more rapidly toward its head than Nin Bay. The basalt hills of Kamasusu and Puró Islands on its northern side show their steepest faces in this direction and the deepest part of the bay is close to these islands. The channel between the two is about 400 meters wide and reaches a depth of 17 meters, whereas the channel between Puró and the mainland although slightly wider, has a greatest depth of only 4 meters, a wide bench with a maximum depth of 2 meters joining the island with Gapus Peninsula. The western side of Puró Island is fringed with mangroves and the mudflats extend out for some distance. At the head of Loog Bay is a broad stretch of beach and mud flat, and the mangrove swamp extending south from Port Mandaon forms the greater part of the isthmus. The south shore of the bay is low-lying and fringed with coral reefs and mangrove swamps. Near the western point there is a smaller bay reaching to the southeast about 2 kilometers and continued inland in a large mangrove swamp. Talisay Point at the southern side of the entrance to the bay is low and fringed with mangroves, with a coral reef extending out about half a kilometer.

Port Mandaon is the third portion of the bay, a narrow stretch of water extending nearly north and south, into which flow the Mandaon and Tagpoc Rivers, as well as several smaller streams. The deepest channel is on the western side under the hills east of Mandaon. The maximum depth reached in this inner bay is 7½ meters at a point near the western shore, about 2 kilometers north of the mouth. Wide mud flats and large mangrove swamps occur on the eastern shore and at the northern and southern ends. The narrow strait connecting Port Mandaon with the outer bay is of interest because of its depth. Just inside of Sanig Point the soundings show a depth of from 3 to 6 meters; however, four are encountered in the narrowest part of the strait, giving 13, 15, 16, and 17 meters; outside in Nin Bay the water again shoals rapidly to 3 meters. This deep "pothole" and the deep channel between Kamasusu and Puró Islands seem to represent old river channels and consequently imply a considerable amount of submergence, 20 meters at the least. The "pothole" between Gapus Peninsula and Mandaon Point seems to be all that remains of a large stream valley. The broader stretches have silted up, while the former gorge, now the strait, has been kept open through tidal scour. It is not possible to venture any opinion as to the courses of these two submerged streams or as to what led to the cutting of canyons through the basalt ridge instead of their following the broad southwesterly valley now marked by Loog Bay. In all probability the conditions were not unlike those in the Lanang district, where fissuring in two directions has influenced drainage readjustments.

THE COUNTRY SOUTH OF NIN BAY.

A fine view of the country to the south may be obtained from Kamasusu Peak, this view extending as far as the Zapatos Islands, small islets between Masbate and Panay. As far as can be seen, a narrow and regular range of fairly high mountains extends to the southwest. These grade down to a constantly narrowing plain on the east. This plain, except possibly for the outer fringe where the mangroves have been at work as a land-forming agency, does not appear to be a coastal plain in the true sense of the word, but rather a plain of erosion, terrestrial, or marine, in part covered by wash from the hills.

The central range rises without foothills and the plain below may be roughly divided into three belts, the first with smooth outlines where the wash from the hills has covered previous irregularities; the second, grading into the first and in places reaching the sea, a plain broken by small, irregular hills having the appearance of "monadnocks;" and the third, an irregular fringe of mangrove swamps together with the smooth, flat stretches probably formed by this agency.

The submarine contours of Nin Bay suggest depression rather than elevation and this would be in accord with the topography of the coastal plain. An elevation of 35 meters would connect Masbate with Panay by a narrow ridge containing Jinototo and the two Zapatos Islands, which would stand out as peaks above the rest of the ridge. Mr. Worcester,[10] reasoning from zoölogical evidence, suggested that Masbate, Panay, Guimaras, and Negros were formerly connected, and at least as far as concerns Masbate and Panay, the physiographic evidence confirms this. Dr. Becker,[11] following this and from a study of the charts of these waters, suggests the separation of these islands by the submergence of a coastal peneplain. The prolongation of the southern fork of Masbate does not form a continuation of the western line of the hills of Panay, but is offset to the east so that the Jintotolo Channel is S-shaped. A deep channel extends from the mouth of the Panay River east of the connecting ridge, apparently a submarine prolongation of that river, and in that case furnishing further evidence of depression. This channel follows a northeasterly course as far as Jintotolo Island, where it makes a sharp turn and runs about S. 30° E., roughly parallel to the main prong of Masbate.

THE SOUTHWESTERN RANGE.

Leaving Port Mandaon and traveling eastward across the island, one passes through 5 or 6 kilometers of gently rolling country—the same plain as that crossed in coming from the north—and then follows the valley of the Tagpoc to the mountain range. A large hill of irregular outline stands on the north, while to the south a range of low hills extends out from the main range in a northwesterly direction. The upper part of the main ridge, here known as Mount Gantal, is very steep, rising from an elevation of about 200 meters where the main part of the ascent begins to about 550 meters at the pass, less than a kilometer distant. At this point the axis of the range has a direction of N. 10° E., but farther south it resumes its normal northwesterly direction.

The underlying rocks in the lower part are grits or pyroclastic rocks much decomposed, with one outcrop of a black slate. The summit of the ridge shows fine-grained igneous rocks also much altered, while a red slate outcrops on a spur extending eastward from the summit. After a steep descent on the eastern side a rough plain studded with small, irregular hills is reached. The Burakai River, having its headwaters near the pass, flows west by south into the Gulf of Asid. The country between the ridge and the gulf shows even more clearly than on the west that its lack of relief is due to combined erosion accompanied by upbuilding from the wash from the ridge, rather than to uplift. In other words, it is a plain of degradation rather than a true coastal plain. The loose material is largely composed of irregular gravel and there are numerous small "monadnocks" and outcrops of a red slate.

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[10] *Proc. U. S. Nat. Mus.* (1898), **20**, 578.

[11] *U. S. Geol. Sur., 21st Ann. Rep.* (1900), Pt. 3, 567.

The Gulf of Asid is a broad, shallow bay occupying the space between the two prongs of the island. The deepest portion is along its western shore, but it is nowhere over 40 meters in depth. At the head of the bay, near Milagros, it deepens so gradually that there are 2 or 3 kilometers of sand exposed at low tide. The eastern side of the gulf is very shallow and filled with numerous reefs and small islands. The barrio of Mangsalange is situated some kilometers to the east of Milagros, whence the trail leads to the copper and lead deposits. Conditions here are similar to those on the west shore of the gulf, but the plain is much rougher because the hills are farther inland and lower and consequently the surface is not smoothed by the piedmont wash deposits. A small hill of hornblende andesite rises near the coast at Mangsalange and further back is an irregular plain with numerous small hills, capped by a light-colored, coralline limestone. Outcrops of a red slate similar to that found on the western shore of the gulf, together with some jasper occur in the stream beds. Farther inland the copper and lead deposits are reached. Native copper occurs scattered irregularly through a melaphyre, which is sheared and jointed along lines running north and N. 60° E. Many veins occur nearby in a country rock of decomposed feldspar porphyry, some of these carrying copper ores and others galena. The usual strike is from 10 to 20 degrees east of north, showing that even as far east as this point the northeasterly series of lineaments is still present. The white limestone found near the shore is no longer present, but the small hills are capped with a dark limestone similar to that found in the Guinobatan canyon in the Aroroy district. Thick forest is encountered northward from this point towards Mobo, and little can be seen of the general nature of the country. To all appearances a rather low, plateau-like ridge extends in a northwesterly direction, with black limestone outcropping on its southern side and on its summit, overlying a series of volcanic rocks, which in turn overlie the older slates.

Between Masbate and Milagros the ridge is broken by a broad, northeasterly trough, extending across the island, being a southwestward prolongation of Port Palanoc. The dark limestone is also found in this depression, showing that it is of comparatively early origin.

Between Milagros and Lanang the country becomes more rugged and the hills seem to be higher. This portion of the island is for the most part heavily wooded, and little idea could be gained of the general topography. Occasional outcrops of the same dark limestone and rare outcrops of a dark slate underlying the limestone, are found near the headwaters of the Lanang basalt and basalt conglomerates are prominent. The streams cut deep canyons and the topography is generally younger than it is nearer the sea.

The country southeast of the town of Masbate was not visited, but as far as can be seen from an examination of the charts, Port Palanoc, with the transverse trough already mentioned, forms the last important northeasterly lineament. The entrance to this bay is through a narrow channel less than 300 meters in width and about 60 meters in depth. On the northeast the deep water is close to the shore, but on the opposite side a coral reef extends out for about 600 meters. This narrow channel is nearly a kilometer long, and at the end of it the bay suddenly widens and there is a small, but deep, branch to the southwest. The town of Masbate is situated at the junction of this branch with the main bay.

THE SOUTHEASTERN PENINSULA.

I was unable to visit this part of the island, so that all my information is derived from a study of the charts. These, while complete as to coast line and soundings, are sadly lacking in interior topography, only the most prominent peaks being shown. According to the map published in the "Atlas de Filipinas" the streams flowing into the Gulf of Asid are much longer than those flowing northeast, thus implying that the crest of the range as a whole fronts the northeast side. Peaks 383, 514, and 403 meters high are shown between Mobo and Uson. Two peaks are situated near Cataingan, height not given; these are termed the *Tetas de Cataingan.* Deposits of coal have been worked between Cataingan and Palanas, and the Spanish records show that there is here a coal-bearing formation of considerable extent. Reëntrants, following the northwest-southeast trend, are shown in Uson and Naro Bays and Port Cataingan. On the southwest coast the land is generally low, except for the single peak of Mount Vigia on the coast midway between Milagros and Point Caduran.

The changes of level for western Masbate seem to have been as follows: An old land surface, which itself contained sedimentary rocks, as is shown by the red slates found in various places, was probably rather maturely dissected and the streams given something like their present courses. Depression followed, during which the black limestone was deposited, and reëlevation, during which the same limestone was largely eroded. It is probable that during this period Masbate and Panay were connected, and the Panay River flowed through what is now the Jintotolo Channel. Another period of depression separated the islands and allowed the formation of the later white coralline limestone found at lower levels. At a subsequent period a partial elevation took place in which Panay and Masbate may again have been connected, but the northern shore of Masbate, between Ports Palanoc and Barrera, does not seem to have taken part in this. Later still some small depression seems to have taken place.

RELATIONS OF MASBATE AND NEIGHBORING ISLANDS.

In the preceding pages I have tried to show that the principal features of the topograhpy of the island are referable to two main sets of lineaments, one trending in a northwesterly and the other in a northeasterly direction, with a third minor set having a northerly trend. A glance at a map of the Visayan Islands will show that this holds good in a general way for the neighboring islands as well. Surigao Peninsula of Mindanao, Leyte, Samar, eastern Masbate, Ticao, Burias, and the southern part of Luzon belong to the northwesterly group. The northeasterly series includes Cebu, Negros, Guimaras, eastern Panay, and western Masbate. Western Panay and Tablas, with possibly northern Cebu and southern Negros, show the northerly trend.

Throughout all these islands there is a curious dovetailing of the land areas with the deeper basins. This is particularly noticeable around Masbate. The southeastern point of this island is separated from Leyte by a deep channel, the soundings giving 150 meters without bottom. Between Samar and Luzon lies the northeasterly San Bernardino Strait. Ticao is connected with Vigia Point in Masbate by a chain of small islands with shoal water between them, but to the northwest the island ends abruptly in water over 180 meters deep. Between Ticao and Masbate the soundings show a maximum depth of 911 meters, but this deep water ends abruptly in Uson and Naro Bays on Masbate. The Island of Burias, instead of being a continuation of Masbate or Ticao, points toward this deep strait. Similarly, its northwestern end is offset to the west from Batangas Peninsula and points into Ragay Gulf.

Much the same conditions exist in regard to the islands showing a northeasterly trend, Cebu, Negros, Guimaras, eastern Panay, and western Masbate. These lie to the southwest of the northwesterly series, but the northeast influence is shown in San Bernardino Strait and Sorsogon Bay on Luzon. Northern Cebu, southern Negros, and the southern part of Tañon Strait all show northerly trends. Between Cebu and Negros, Tañon Strait has a depth of over 200 meters, but is cut off on the north by the small islands west of Cebu and on the south by the coast of Negros. Southern Negros seems to follow the northerly series of lineaments, but the island as a whole has a northeasterly trend. Guimaras Strait is between northern Negros and Panay, this does not show soundings exceeding 25 meters, but a deep northeasterly embayment west of southern Negrôs ends abruptly at Guimaras Island. Abella[12] has called attention to the island of Guimaras and the range of hills on the southeastern coast of Panay as forming a part of the orographic line extending from Borneo through the Sulu Archipelago, Basilan, the Zamboanga Peninsula, Negros, and Masbate, but as I have already shown, the Panay range does not continue directly in western Masbate, but is there offset to the northwest.

The northern series which appears in northern Cebu and southern Negros is of minor importance in western Masbate, and attains its greatest prominence in the *Cordillera* of Panay and the Island of Tablas. Here again Tablas is not a direct continuation of the Panay *Cordillera,* but is offset to the west.

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[12] Descripción física, geológica y minera en bosquejo de la Isla de Panay. Publicación oficial, Manila, 1890.

ILLUSTRATIONS.

PLATE I. Map of Masbate, P. I.
II. Map of Aroroy mining district, Masbate, P. I.
III. Map of route. Aroroy to Mandaon, Masbate, P. I.

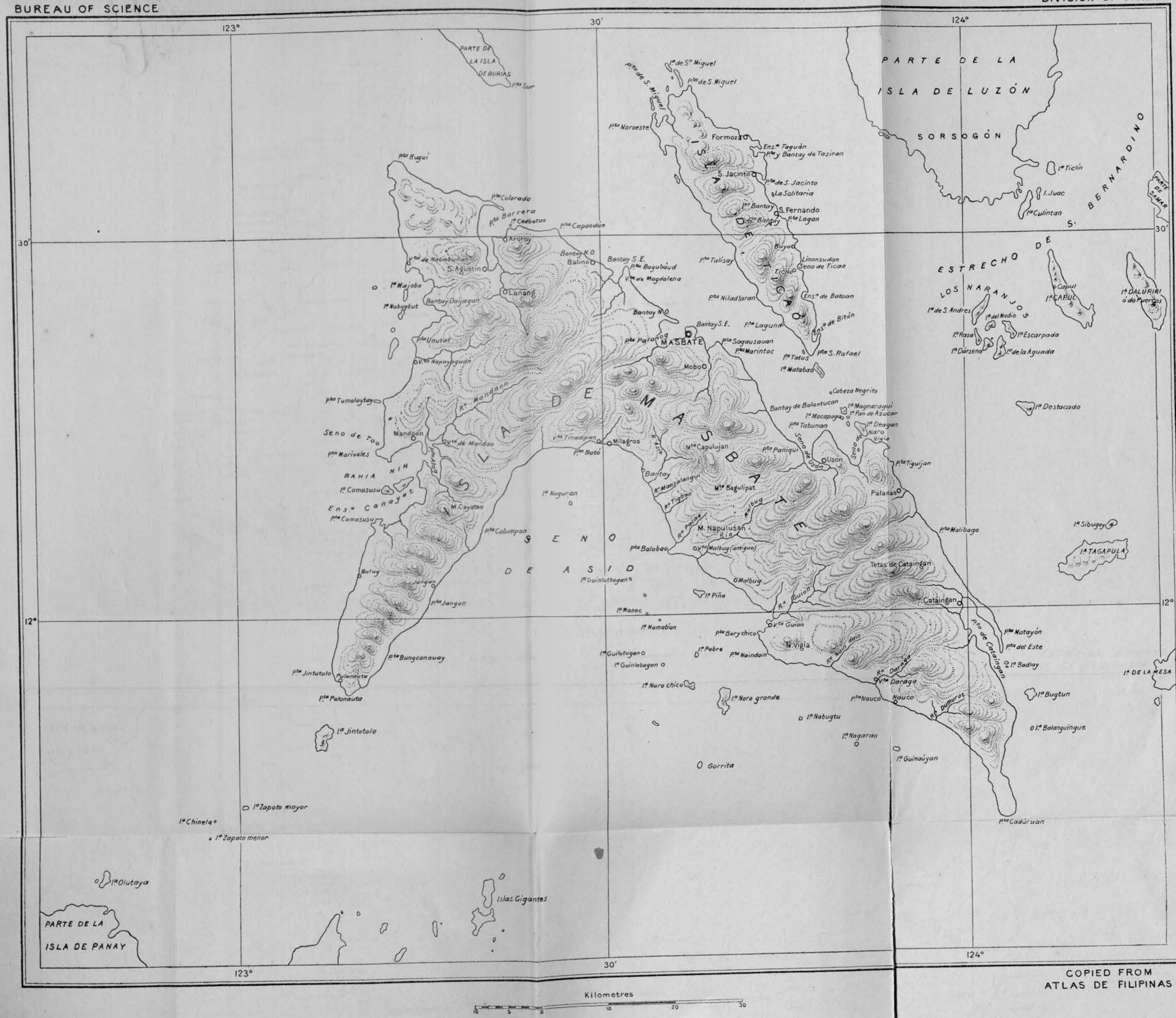
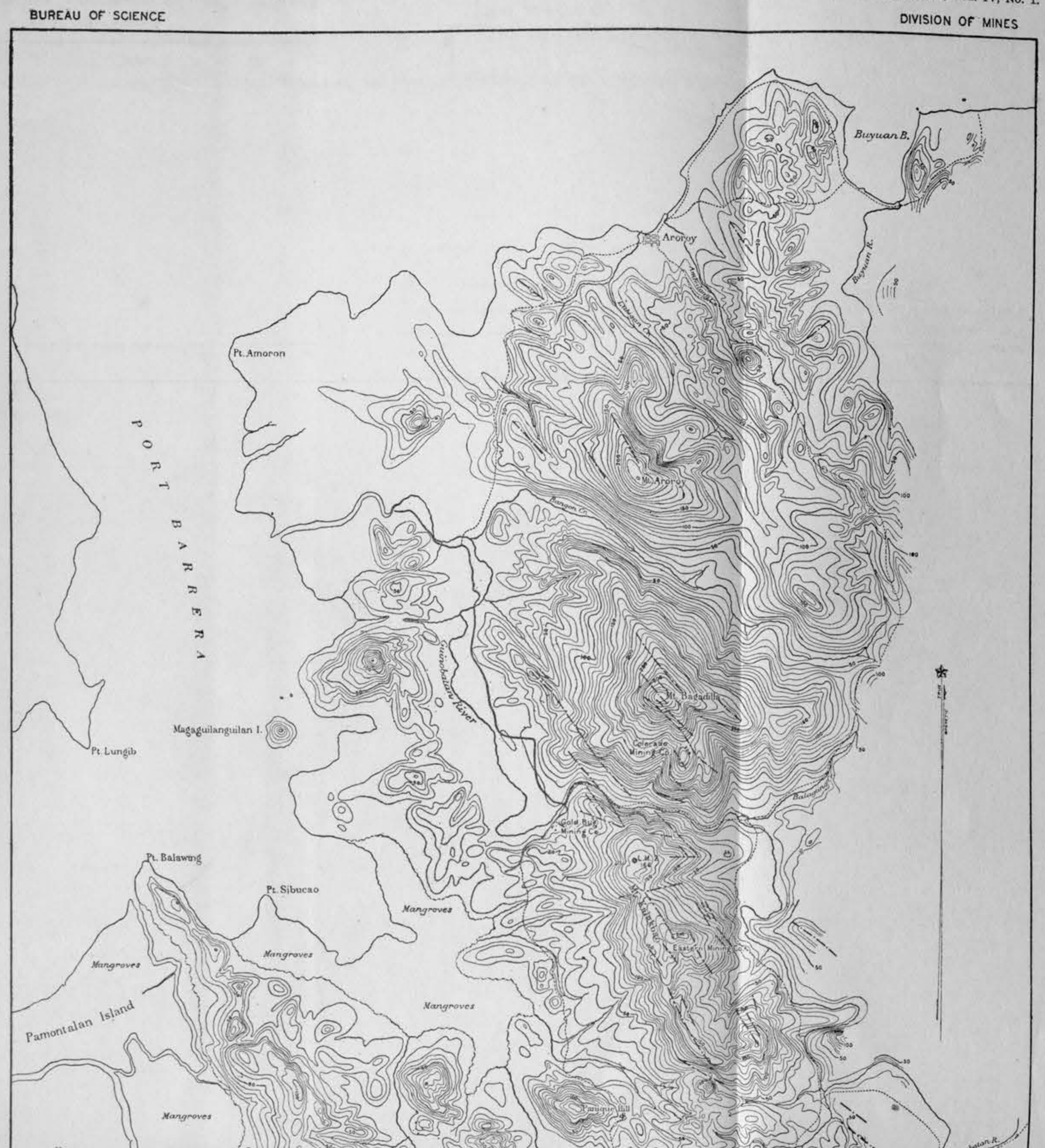


PLATE I. MAP OF MASBATE, P. I.

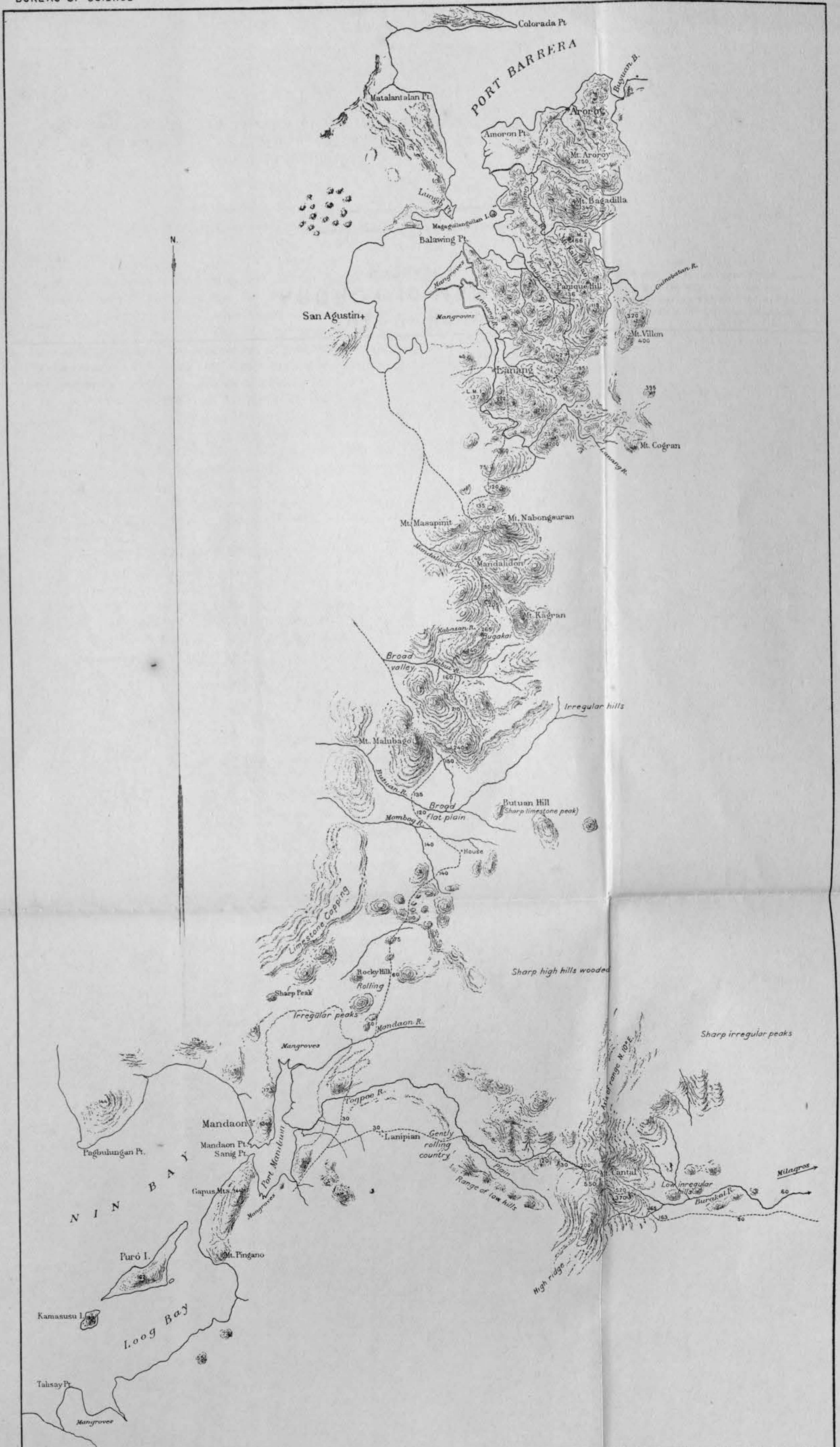


Triangulation by H. M. Ickis and M. Goodman
Topography by H. G. Ferguson
Coast line from U. S. Coast and Geodetic Survey Chart.
1907-1908

Plate II. Aroroy Mining District, Masbate, P. I.

BUREAU OF SCIENCE

DIVISION OF MINES



FEBRUARY 1908

MAP OF ROUTE
AROROY TO MANDAON
MASBATE P. I.

SURVEYED BY PACING AND COMPASS
ELEVATIONS BY ANEROID, UNCHECKED
TOPOGRAPHY BY H. G. FERGUSON
COAST LINES FROM U. S. COAST SURVEY CHART
HEIGHTS IN METERS

PLATE III.

CONTRIBUTIONS TO THE PHYSIOGRAPHY OF THE PHILIPPINE ISLANDS: IV. THE COUNTRY BETWEEN SUBIG AND MOUNT PINATUBO.

By WARREN D. SMITH.

(From the Division of Mines, Bureau of Science.)

A practice march from Olongapó, United States naval station, to Mount Pinatubo, Zambales Province, was made in the month of April, 1907, by a batallion of the United States Marine Corps, under the command of Major E. K. Cole. The botanical notes referred to in this paper are contributed by F. W. Foxworthy, of the Bureau of Science, who accompanied the expedition; the sketch route map is by Sergeant Stockel and myself; the photographs were taken by me. Our thanks are due to Major Cole, United States Marine Corps, and to Dr. Jos. H. Thompson, assistant surgeon United States Navy, for the assistance they rendered and for the many courtesies they showed us.

The time consumed in making the trip from Olongapó to Pinatubo and return, a distance of approximately 200 kilometers, was one week; the average marching rate was therefore about 28 kilometers a day. As 20 kilometers a day is the usual rate with full equipment in the Tropics, it was not possible to make a very thorough examination of the country.

Subig Bay, our starting point, is one of the most beautiful in the Archipelago, large enough to shelter several battleship fleets as well as all the commercial vessels that visit Manila. The bay is very irregular in outline and has several islands scattered here and there. Its beauty is further enhanced by a girdle of hills, some of which are quite worthy of the name of mountains. Some of these are heavily wooded, while others are rounded and bare, thus giving a clue to the underlying rocks. The former are usually of limestone, shale, or andesite formation, the latter of serpentine or pyroxenite. Both the formation and the topography of the Cinco Picos range are remarkably similar to much of the California coast range. A thorough examination of this region will no doubt bring to light a host of minerals we have not yet found, but the presence of which we are led to suspect from the paragenesis of minerals.

We began the march proper from Subig at the head of the bay. The first day's journey took us along a comparatively level, alluvial-filled valley, or a series of valleys, separated by low spurs from the hill country to the east. This is good rice land. The soil is largely the disintegrated débris from the immediately adjacent hill country. Cuts along the road for the most part show a dioritic formation, in some places overlain by shales. At Pamatauan the country begins to undergo a noticeable change, it becoming more level and dryer. A short distance before Castillejos is reached there is a sudden and complete change both in soil and vegetation. From here on the country simulates in a remarkable degree the arid regions of the western part of the United States. Practically the only trees are *agoho* (*Casuarina equisetifolia* Forst.), which appear very much like pines. Between Santa Fé and Aglao there is some lowland which is flooded by means of ditches leading from the river and which makes good rice land.

The great flat stretch of country between Castillejos and Santa Fé is almost treeless and has a coarse, sandy floor with occasional bowlders. The Aglao River flows through this almost uninhabited stretch of country between high and steep banks of sand and gravel. The heat and glare encountered on the march across this part of the route are very trying, particularly to soldiers under full equipment.

Monadnocks of various sizes here and there are to be seen on this plain. One of these just beyond Castillejos is composed of andesite, and still a larger one near, but across the river from Aglao, 215 meters above the plain, is made up of practically the same rock as that constituting Mount Pinatubo, namely, feldspar porphyry.

A few miles east of Aglao we left the broad, nearly flat plain and entered a valley which flares widely at its mouth, but which gradually narrows toward its head. This we followed all the way to the foot of Pinatubo, crossing and recrossing the Aglao several times. At the entrance to this valley we pitched camp on the high bluff overlooking the river.

Here we were visited by a small band of wandering Negritos, a photograph of whom, together with some of the American marines, is shown on Plate I. As these little people have already been described by ethnologists, no further mention need be made of them except that they are a nomadic, extremely shy tribe. They are short, usually thick set, kinky-haired, quite dark, and resemble as their name implies little negroes. The men use bows and arrows, wear few clothes, generally only a breech clout, and are very active. They live for the most part on wild hogs and deer and probably any sort of wild meat they can find. Their houses are of the rudest kind; in fact they are nothing more than temporary shelters of grass, trees or caves. For a full description of these people I refer the reader to Mr. Reed's[1] work.

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[1] Reed, W. A.: Negritos of Zambales, *Ethnol. Sur. Pub.* Manila, (1904), Pt. 1, 2.

We left part of the force behind at Camp Clinton and then proceeded up the valley, making halts as indicated on the accompanying route sketch. At the foot of the mountain proper, our force again was divided and one company took the trail over the pass and down the the long eastern slope to Camp Stotzenburg on the Pampanga side. The remaining company with us marched to the next water hole and then likewise separated, one part remaining below with the superfluous baggage and arms. Here a select number of men were chosen and we began one of the hardest pieces of mountain climbing I have engaged in in the Philippine Islands. From the 915 meters' elevation up to about 1,525 meters the trail leads over an exceedingly rocky slope where great care must be taken not to dislodge loose stones and bowlders and hurl them upon the party following.

The Negrito guides easily outdistanced us in this part of the climb. At 1,525 meters we entered the heavy growth of timber and small vegetation which so persistently clings about the summits of the majority of high mountains in the Tropics. The botanist calls this the *mossy forest.* as it is marked by a great profusion of moss covered trees.

The white men of the party kept with the Negritos after entering the forest, and one or two made even better headway. Although the trees are somewhat stunted on the summit of the mountain, the vegetation is very dense and this, together with the haze, prevented our having a very clear view over the surrounding country.

PHYSIOGRAPHY OF THE AGLAO VALLEY.

The Aglao Valley presents a physiographic puzzle which to me at least has been almost inexplicable. A cross section of it about midway in its length is given in the accompanying map. This figure shows that the valley consists of two chief parts, an upper portion wide, flat-bottomed, and with moderately steep walls, and a second and lower part, a deep gorge with exceedingly straight walls, narrow and rather more V-shaped at the bottom.

The gorge shows that the valley filling is of loose material, sand, and bowlders. As these gorges are in places, from 30 to 45 meters deep we can count on the filling extending to at least that depth, and if we continue the natural slopes of the valley walls downward so as to reconstruct the preëxisting valley, we get some idea of the probable amount of fill, which must be in the neighborhood of 120 to 150 meters in depth.

The floor of the upper valley is strewn with immense bowlders, some of them many tons in weight. They possess a remarkable similarity to a valley train in glaciated countries. In certain portions of the valley there are gorges smaller than the large one which follows more nearly the central line of the valley; these are along the sides, just as are usually found along the sides of glaciers.

Three distinct stages are to be noted in the history of the valley:

a. The erosion of the broad valley;
b. The filling of the broad valley;
c. The engorging of the Aglao River.

The first stage was that of normal erosion and began immediately as this area rose from the sea. The second points to submergence or sinking of the land mass and cessation of erosion. The third marks reëlevation of the land and quickening of the streams, so that they could again begin to cut.

It has occurred to me that very possibly when this region subsided, a tidal bore may have passed in and out of this valley and thus have spread the immense bowlders over the floor as we now find them. (Plate II.)

Plates III and IV are two photographs showing some interesting topographic features along the route. The formation is presumably the same as that composing Mount Pinatubo. However, as we had not time to examine the rocks very far from the trail, I shall not go any further into the discussion in this preliminary notice.

At about 440 meters' elevation the steep climb to the summit of Mount Pinatubo begins. The slopes from this elevation on to about 1,525 meters are quite bare and covered with small bowlders, but I saw no sign of volcanic ash, nor any of the usual indications of volcanic activity. Plate V shows this slope material at close range.

There is a small, conical peak to the right and the rear which is the highest point on Mount Pinatubo and of the whole range between Zambales and Pampanga. We reached the high point to the left, 1,705 meters aneroid reading, as the Negrito guide said this was the higher point, and then found a cañon of great depth and width cutting us off. As our rations were running short, we were forced to forego the additional descent and climb. We would not have gained much if we had undertaken the ascent, as the formation is undoubtedly the same on the two peaks. We could see that with a glass. Plate VI, taken from an elevation of 1,500 meters, will give some idea of the view toward the west over the route we came.

The Pinatubo rock is a feldspar porphyry. On weathered surfaces it is a dirty gray, giving a pepper and salt effect. On the fresh surfaces it is seen to be made up of idiomorphic crystals of glassy feldspar, or plagioclase, varying in length from 1 or 2 to 15 millimiters. The black mineral is usually a well-crystallized hornblende. The matrix is grayish to yellow. The rock is not firm so that it easily weathers. The hornblendes are invariably much smaller than the plagioclases. It is this rock which, disintegrating, furnishes the coarse sand of the valley and the plain.

I shall quote here a few sentences from Dr. Foxworthy's notes on the plant life on the mountain:

> The soil seems to become progressively worse as one ascends the valley and trees almost entirely disappear, except at the edges of the formation along the water courses.
>
> In the river valley itself there is, comparatively, a very rich vegetation. In the rocky bed of the main stream there are numerous *agoho* trees (*Casuarina equisetifolia* Forst.) and a good many ferns and herbs of various sorts. Wherever the valley widens out, there are found a number of tall trees of different kinds with undergrowth of wild banana, bejuco, etc.
>
> In the small upper valleys of the small branch streams are found some tree ferns, several figs, *Dalbergia*, *Cratoxylon*, *Duabanga*, and *Vaccinum* species.
>
> The coarse, rocky soil at the base of Mount Pinatubo contains practically no vegetation, the very small amount of grass which starts being periodically burned off by the Negritos.
>
> The bare, burned surface of the mountain which is scarred by land slides goes up to about 1,400 meters, where the mossy forest begins very abruptly, being protected only by a narrow fringe of very coarse, reedy grasses. The lower part of the mossy forest contains a few figs and *Vaccinums* with some *Rubus* and *Deutzia* in the undergrowth. One of the few herbs is a *Carex*. Among the less common shrubs are *Cyrtandra* and *Geniostoma*. From about 1,525 meters to just about the top there is another type of vegetation. In this, ***Medinilla whitfordii*** Merr. with its brilliant purple flowers is the most conspicuous, and this one tree constitutes fully one-half of the flora. Interspersed with this are ***Ficus*, *Alangium***, and *Vaccinum*. In the lower part of this range, the *Medinilla* reaches a height of about 30 feet and is a very clearly marked tree. In fact its shape is such as to give almost the effect of a formal Japanese garden. In the upper part of this range the tree is very stunted in habit, being only 1 or 1.5 meters in height.
>
> One of the few flowering herbaceous plants found in this range is *Nertera depressa* Banks & Soland. In the more sheltered parts of this formation, filmy ferns, lichens, and mosses are very abundant.
>
> At the summit all the woody plants are stunted in habit. *Sphagnum* and other mosses, and lichens are very abundant. Great masses of moss cover the tree trunks. Many orchids are found in this moss on the trunks, one yellow-flowered form being very abundant.

I shall conclude this preliminary note by saying that Mount Pinatubo is not a volcano and we saw no signs of its ever having been one, although the rock constituting it is porphyritic. The mountain and the surrounding country afford excellent opportunity for physiographic studies. The region is quite unique and I have seen nothing in the Philippines quite like it.

It is a matter of regret to me that I have not time now to return to it, and so for the present this preliminary account must suffice.

ILLUSTRATIONS.

PLATE I. Negritos and United States Marines.
II. Valley of the Aglao, showing large boulders.
III. The valley of the Aglao. Mount Pinatubo in the distance obscured by the haze.
IV. Topography along the Aglao River, Zambales Mountain. The formation is igneous.
V. Character of material on slopes of Mount Pinatubo at 1,370 meters' altitude.
VI. Looking west over the Aglao Valley from 1,520 meters' elevation on Mount Pinatubo.
VII. Map of route Paumatawan-Mount Pinatubo.

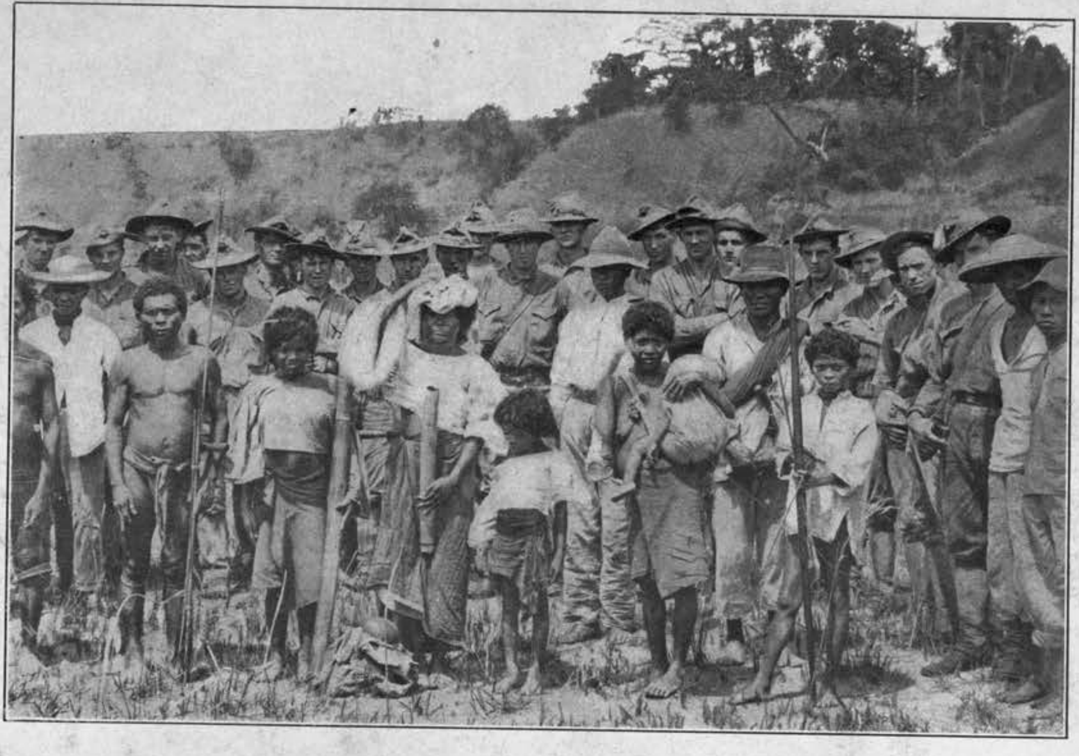


PLATE I.

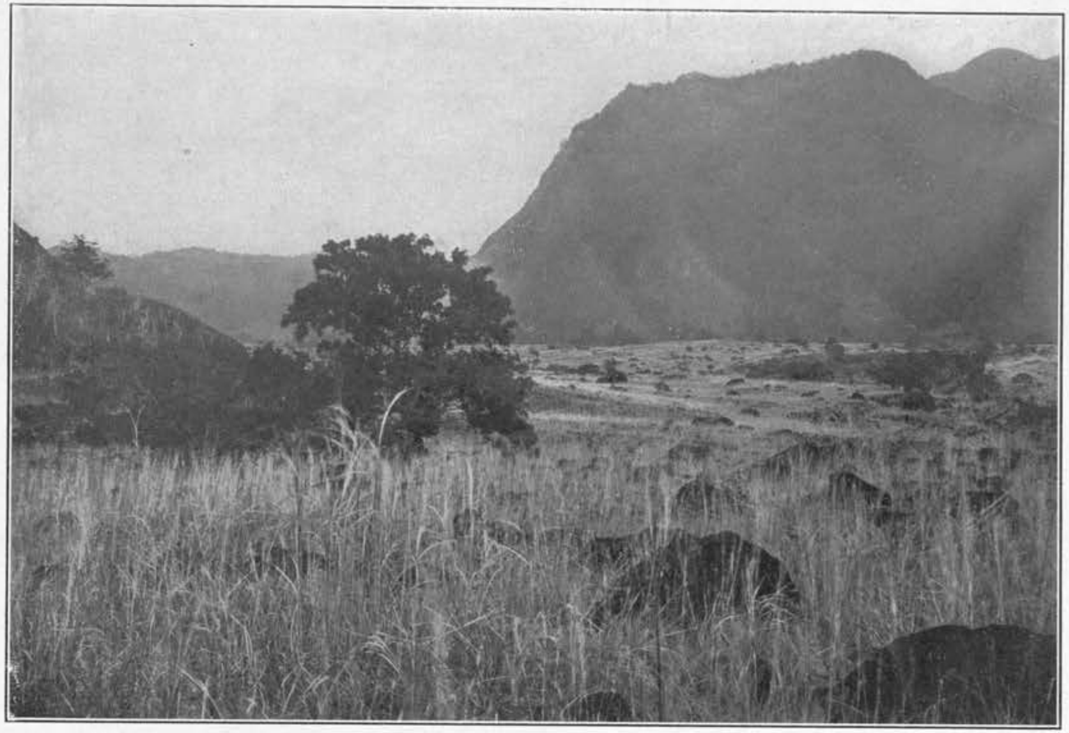


PLATE II.

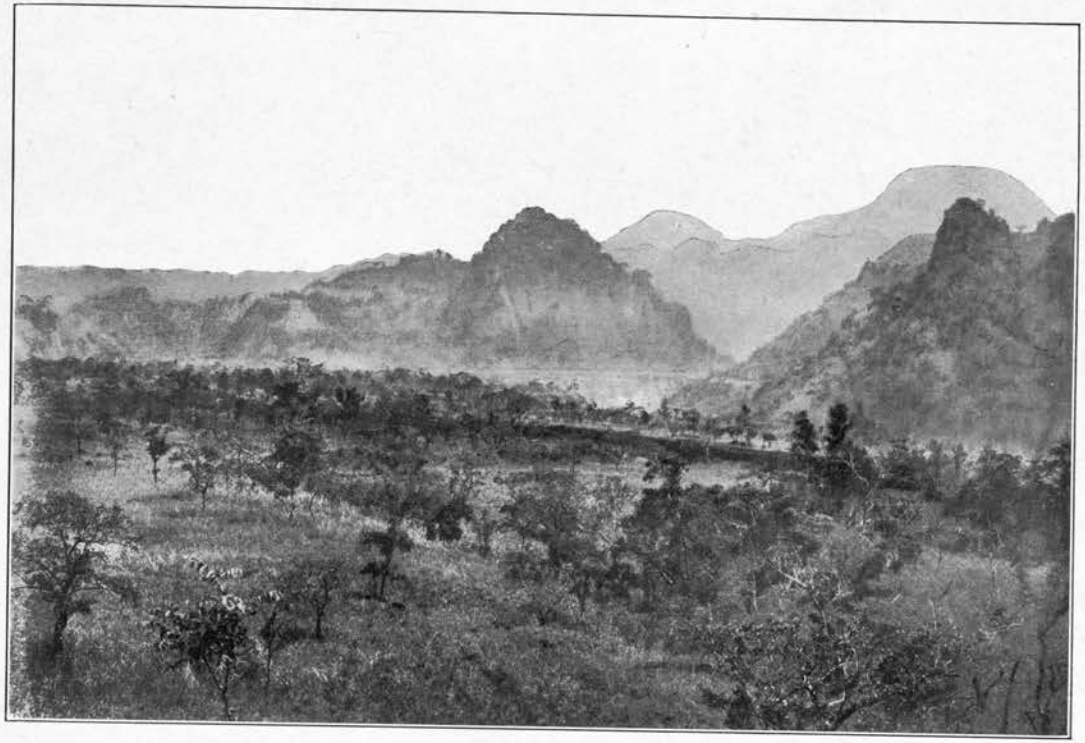


PLATE III.

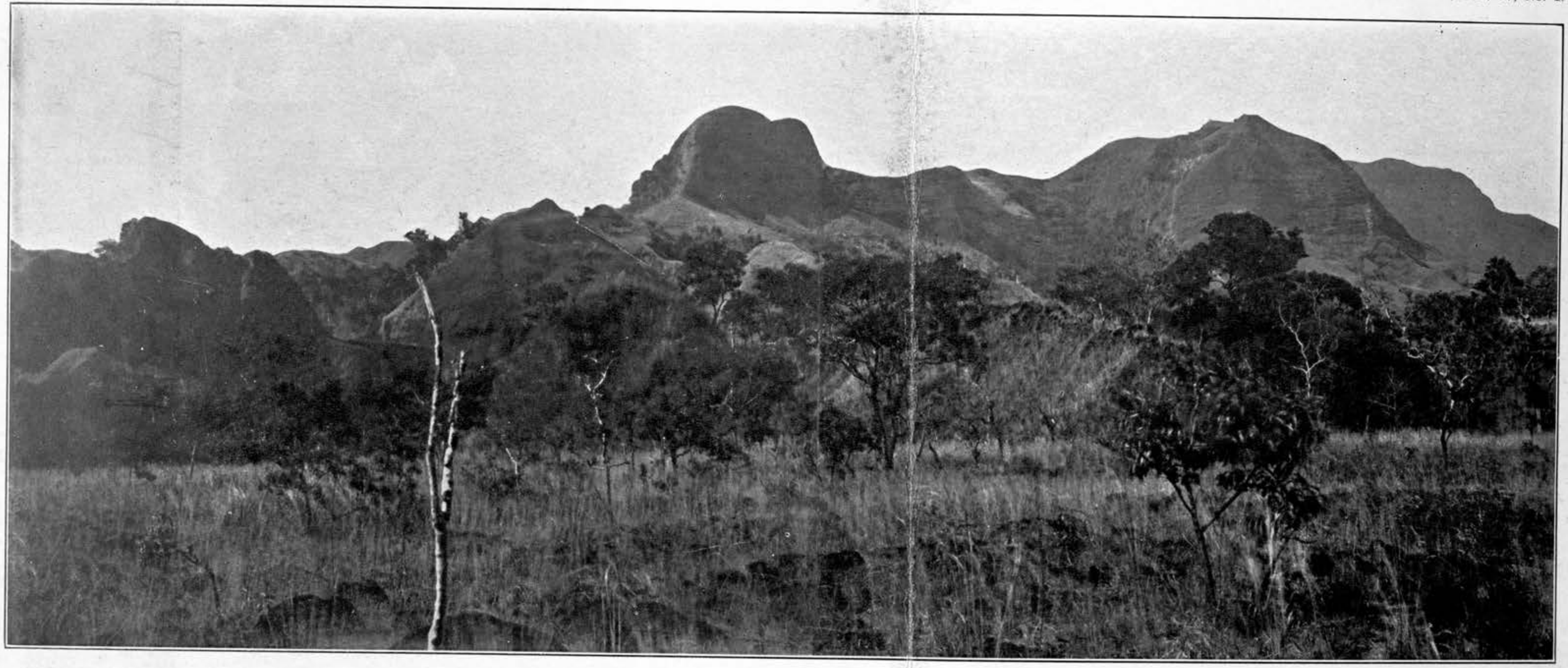


PLATE IV.

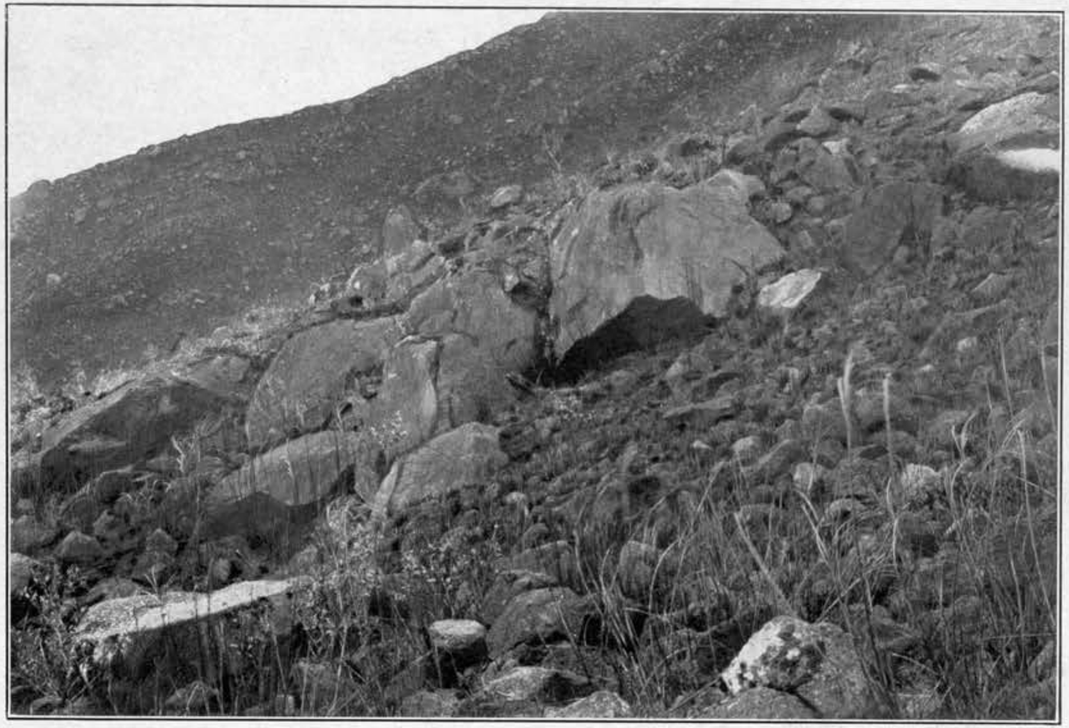


PLATE V.

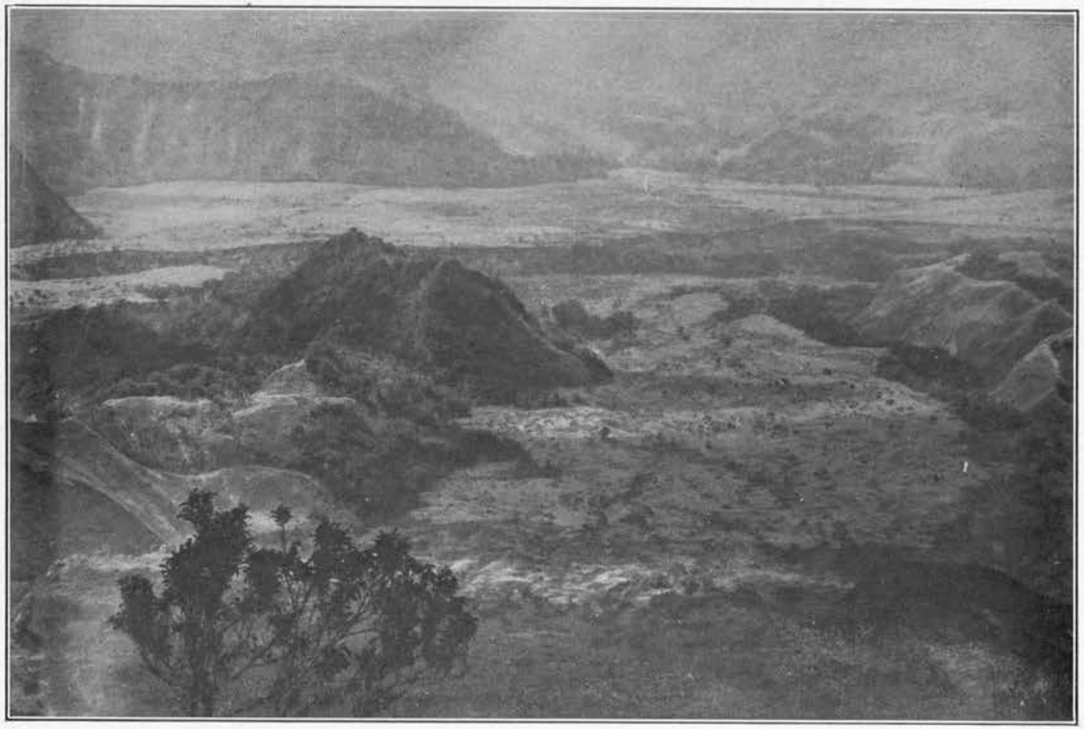
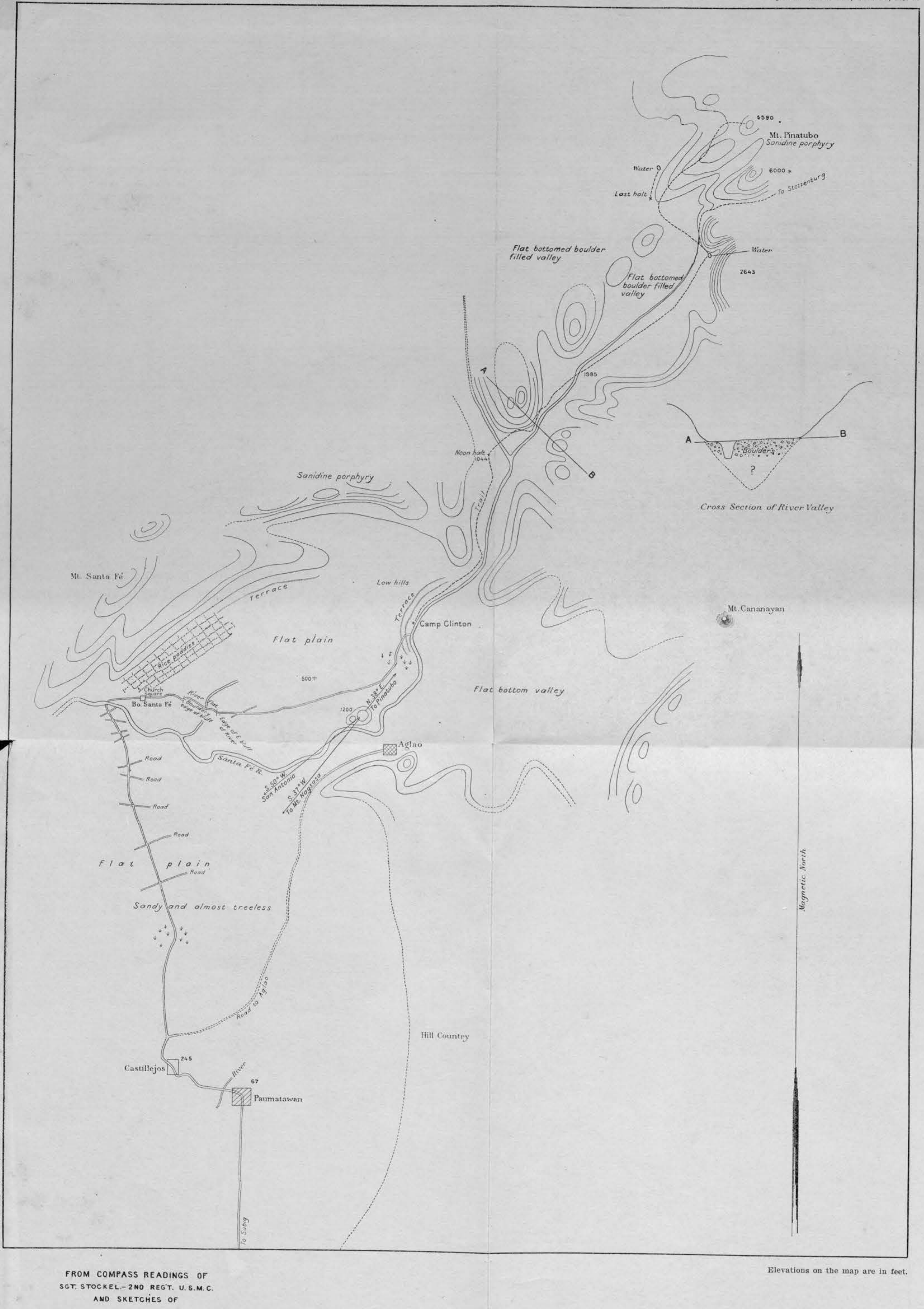


PLATE VI.



FROM COMPASS READINGS OF
SGT. STOCKEL.—2ND REG'T. U.S.M.C.
AND SKETCHES OF
W. D. SMITH, GEOLOGIST—BUREAU OF SCIENCE
April 21-29-1907

Elevations on the map are in feet.

3 Miles

PLATE VII. MAP OF ROUTE FROM PAUMATAWAN TO MOUNT PINATUBO, LUZON, P. I.

FILIPINO EARS—A CLASSIFICATION OF EAR TYPES.

By Robert Bennett Bean.

(From the Anatomical Laboratory, Philippine Medical School, Mànila, P. I.)

INTRODUCTION.

The cosmopolitan population of Manila affords abundant material for the study of ears of all kinds. Here, if anywhere in the world, all races and many-types of mankind are represented; the white, the yellow, the red, the brown, and the black. I had previously observed ears in America and Europe for several years, and since my arrival in the Philippines, on June 29, 1907, have given particular attention to the ears of the Filipinos and the other inhabitants of these Islands. The material for this study was gathered by close inspection, sketches of dwellers in the suburbs of Manila as well as the city proper, of the Assembly, and notes made from these data and from a consideration of other collections of Filipinos. I have also included a study of the prisoners at Bilibid, the penitentiary of the Islands.

GENERAL TYPES.

Previous observations lead me to select the long ear with pendant lobule; the small, round, flaring ear, and the large, oval ear with shelf instead of lobule (three European types) as a basis for the classification of Filipino ears. Ears without lobules constitute a fourth group, and others that do not resemble any of the four have been added. After these five groups of ears have been distinguished, every individual is noted that can be observed carefully enough to be sure of the ear type. Only males are considered, although a few female Filipinos (more than 100) are also classified. The first 924 individuals are assigned to the groups just given.

Ears of adult male Filipinos.

Long	345
Oval, shelf, no lobule	86
Round, flaring	84
No lobule	122
Others	207
Total	942

The important results of these preliminary observations corroborated by further study are the facts of the occurrence of a great number of long ears and of many ears without lobules.

Karutz[1] from the literature assembles the ear length of 1,452 foreigners, to which he adds 309 further measurements on foreigners and 300 of adult men, 273 of whom are recruits of a German regiment. The results may be placed so that the longest eared people come first, each succeeding group having shorter ones than the preceding, the individuals with ears more than 6 centimeters long being termed long eared and those less than 6 centimeters short eared.

Ears of 1,452 foreigners, not German.

LONG EARED.	SHORT EARED.
Mongolian.	Papuan.
German (Schwalbe).	Australian.
German (300 Karutz).	Negro.
Malay.	Mestizo.
Aryan.	"Niloten."
Semite.	Finn.
American.	Singalese.
	Hamites.
	Bushman.

309 further measurements.

LONG EARED.	SHORT EARED.
Aino.	Polynesian.
Semite.	Micronesian.
Aryan.	Papuan.
Hamite.	American.
	Negro.
	Bushman.

This classification is but slightly altered when the ear length and stature or ear length and ear width are compared. The Malay is closer to the European than any of the Negroid peoples. The large number of long ears (37 per cent) encountered in the first 1,000 Filipinos examined by me indicates that the Filipino is also close to the European in ear form; and this I believe is due to the impregnation of the primary inhabitants of the Philippines by Mongolian and early European, as well as later European (Spanish) peoples. This is made clearer as the investigation advances.

The ear without lobule is present according to Karutz as follows:

Ears without lobule (Karutz.)

	Per cent.
82 Negros	36.7
55 Papuans	29
22 Micronesians	27.2
20 Polynesian	15
89 Indians	4

---

[1] Karutz, H. L. Ein Beitrag zur Anthropologie des Ohres. *Arch. f. Anthropol.* (1900), 27, 732 to 746.

The same (my observations).

	Per cent.
547 Chinese	38
942 Filipinos	23

These observations may indicate Negroid affinities for the Chinese and European affinities for the Filipinos, although 20 to 30 per cent of the majority of normal Europeans have absence of lobule, and the percentage varies among Europeans from "9.2 per cent to 92 per cent." Doubtless absence of lobule is *not* a stigma of degeneration.

Five types for a new grouping are established by notes and sketches made during my preliminary observations; two from the long-eared group and one from each of the others.

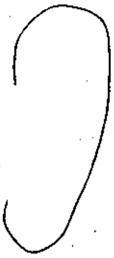


FIG. 1.

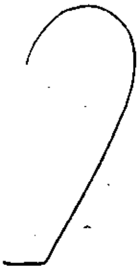


FIG. 2.

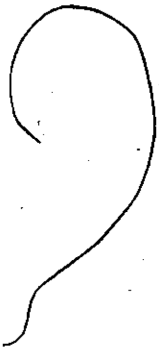


FIG. 3.

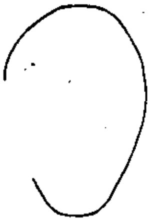


FIG. 4.

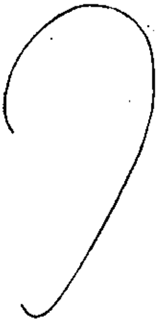


FIG. 5.

FIG. 1.—Type 1 is a long, slender ear, with a straight posterior border and square lobule, the outline a parallelogram with rounded corners.

FIG. 2.—Type 2 is long and flat, with a straight posterior border, and square lower helix without lobule.

FIG. 3.—Type 3 is large and oval, with a shelf where the lobule attaches to the cheek.

FIG. 4.—Type 4 is a small, round, flaring ear, in which the lobule and superior part of the helix are symmetrical.

FIG. 5.—Type 5 is long and oval, with large helix and small lobule.

Ears that resemble any one type more than another, but are not exactly identical with it, are put into groups, six of which are differentiated:

Group 1 contains all long, slender, and heavy lobed ears.

Group 2 has long ears with no lobule and a square, inferior helix; the ear is delicately molded and oval, rounded, or irregular in its superior part.

Group 3 has small, round ears that are not always shelved.

Group 4 contains those that are symmetrically rounded, both in helix and lobule, and not always flaring.

Group 5 has ears that are large and oval, without lobules.

The groups are subordinate to the types and each contains only ears that resemble those of the type, for example: The ears of group **1** *resemble* those of type 1. Ears unlike any of the five types or the groups are included under the heading "Others."

Ears of adult male Filipinos.

Type.	Number.	Group.	Number.	Together.	Total.
1	6	1	101	1+1	107
2	25	2	282	2+2	307
3	12	3	120	3+3	132
4	20	4	83	4+4	103
5	3	5	91	5+5	94
Others	148			148	
Total	214		677		891

Type 2 is predominant and the others are each present in about equal proportions. All ear types so far considered are European and characteristic of definite somatologic types of the white man.

Type 1 presents itself on long, lean individuals with long heads and faces, prominent cheek bones, and usually with dark hair and eyes. This ear is designated as Cro-Magnon, because the type of man resembles the cave man of Europe.

Type 2 exists on medium-sized individuals of stocky build, and as it is typical of the Igorots it is designated as Igorot.[2]

Type 3 is found throughout middle Europe (southern Germany, Switzerland, central France) and in America along the Ohio River, in Canada, and on the shores of the Gulf of Mexico, or wherever the inhabitants of central Europe have settled. This ear is termed Alpine, from Ripley's designation of the middle European. It is associated with persons of adipose tendencies, with dark hair and eyes, and broad heads.

Type 4 is called Iberian, as it is found on small, dark, long-headed individuals representing the Iberian or Mediterranean race of southern Europe.

Type 5 occurs most frequently on tall blondes of the Nordic type of northern Europe, and for that reason is designated as Northern.

Naturally, it is surprising to find so many Filipinos with ears resembling those of the European, and in this connection emphasis should be laid upon the fact that the Filipinos examined have not been selected because of obvious European traits of physiognomy, skin color, or some other characteristic, and wherever European traits are apparent the ear of the individual is not noted. At this time, after the second thousand observations have been completed, at least two additional types stand out as predominently Filipino. These I designate as Negroid and Malay.

The Negroid ear is small, somewhat pentagonoid in shape, and without lobule. The Malay ear is small and round with a small lobule which forms a horizontal shelf, the helix often appears as if double rolled by the eversion of the edge of the concha (anthelix), and the upper and lower parts of the helix flare slightly. These two types impress themselves upon the majority of Filipino ears, even when the latter resemble European types.

One more type is selected in addition; a large, well-rounded ear with heavy lobule and broad helix; distinctive of a European type that may be known as the box-headed, big-cerebellumed Bavarian of Ranke, which I designate as B.B.B. Another Iberian ear, named Iberian *b* also occurs; this has no lobule, flares upward, and has an everted concha at its outer border (anthelix), especially below.

---

[2] Bean. The Benguet Igorots. *This Journal, Sec. A.* (1908), 3, 413.

After the above classifications were completed, the haunts of the average Filipino were again invaded and a third set of observations recorded. This time an endeavor was made to separate the masses into classes by registering pedestrians in one list and those seen in street cars and carriages (not the common street cart) in another. Only pure-type ears are recorded; no ears that show mere resemblances are tabulated; those that are not of one type or another are put under "Others."

Filipino ears.

Pedestrians.		Riders.		Totals.	
Type.	Number.	Type.	Number.	Type.	Number.
Negroid	108	B. B. B	104	B. B. B	149
Malay	88	Igorot	69	Negroid	137
Igorot	60	Alpine	52	Igorot	129
B. B. B	45	Cro-Magnon	30	Malay	104
Cro-Magnon	30	Negroid	29	Alpine	70
Iberian *a*	27	Iberian *a*	25	Cro-Magnon	60
Alpine	18	Malay	16	Iberian *a*	52
Iberian *b*	7	Iberian *b*	5	Iberian *b*	12
Others	195	Others	85	Others	280
Total	578		415		993

The totals indicate four ear types as characterizing the Filipino, and four others are not infrequently found. Six of these are European and two are not (Negroid and Malay). The inference can be drawn that the Filipinos of Manila and vicinity are more European than otherwise. The two groups, pedestrians and riders, separate the poorer classes from the well-to-do, and a notable difference in the relative number of ears of the different types in the two groups is observed. Among the pedestrians the Negroid and Malay, whereas among the riders the B. B. B. and Igorot ears predominate. These four ear types are of considerable significance. The B. B. B. and the Igorot ears are probably derivatives of the same original type, and the Negroid and the Malay are similarly related to each other. The fact that the couples of ears are so different enhances the interest attached to them. The Igorot and the B. B. B. ears are large and long, the Negroid and the Malay are small and round or pentagonoid. The Igorot and the B. B. B. ears have no rolled-in rim to the helix, the Negroid and the Malay have an inrolled rim, almost double rolled, due to the eversion of the anthelix.

The Igorot and the B. B. B. individuals are medium sized and stocky, with large, long, square heads; the Negroid and the Malay are small and spare or fat, with small, short, round, or oval heads. The Igorot and the B. B. B. are European types, the Negroid and the Malay are not.

INDIVIDUAL TYPES.

Having determined that European ear types with characteristic morphology pertaining to definite somatologic types of men are present to a large extent among Filipinos, and that other morphologic ear forms belonging intrinsically to the Filipinos are also present, material is at hand to enable us to find the type of Filipino to which each ear type appertains. This is done by confining observations to one type at a time, noting the characteristics of each individual on whom the particular ear type under consideration is found.

The majority of observations were made while walking with the crowd, driving with them, circulating among them, or while riding on street cars, because in this way each individual can be examined for a greater length of time than when the observer is standing to watch them as they pass. Each type was observed during the same length of time, over the same territory, and as far as possible with the same individuals, but the aggregate varied slightly from week to week.

The observations show in general the relative number of each type present in the population, and in this way are a check on previous work. Individuals of all nationalities are included with the following results:

Individual types of ears.

Negroid	194
B. B. B.	167
Alpine	115
Malay	108
Iberian *a*	105
Cro-Magnon	101
Igorot	73
Iberian b	18
Northern	10
Total	891

The Negroid and the B. B. B. ear have changed places but still head the list, the Alpine goes up and the Igorot down, and the Iberian *a* rises above the Cro-Magnon, which is itself above the Igorot. The Northern ear is so seldom seen that it may be neglected in considering the Filipino. The changes mentioned are due in a large measure to the inclusion of European in this classification, especially the American and Spanish. Details of the individual types are as follows:

THE NEGROID EAR.

The Negroid ear is small, somewhat pentagonoid in shape, and without lobule. It often presents a wrinkled appearance about the helix, which folds over almost to the concha; the superior border passes abruptly from the head in a horizontal direction and often joins the posterior border in the formation of a point. The posterior border is straight and appears as if it had been amputated and healed, leaving a scar that has drawn the ear while contracting. The lobule is usually absent or minute in size, the inferior border of the helix passing diagonally downward and inward to the jaw. The individuals on whom this ear is found are almost invariably small, slender, wide nosed, with oval head, straight, black hair, brown eyes, and brown skin, but three tall Filipinos and four short, stocky Filipinos are noted with Negroid ears.

THE MALAY EAR (PLATES I, II, III, AND IV).

The Malay ear is small and round with small lobule, double-rolled helix, and a slight flare at the top and at the bottom. The superior part of the helix often slants slightly downward from where it joins the head and terminates in a small, flat lobule which is horizontal. The concha is large and its edge (anthelix) frequently runs parallel to the helix which gives the appearance of a double roll. The Malay ear appears on at least four groups of Filipinos, all of whom are similar in physical attributes. The individuals are usually small, round headed, wide nosed, and dark skinned, but the following variations appear.

The Malay ear (adult males).

Slender, small, short	45
Heavy, small, short	46
Heavy, medium size	11
Heavy, small, old leather skins	4
Mestizo short	1
Chinese, short	1
Wavy or curly hair	26
Straight hair	82
Total	108

The hair form with a Mendelian proportion indicates that the kinky hair of the Negrito is recessive to the straight hair of the Malay, because the ear resembles the Negrito ear,[3] and the two types are closely related in physical characteristics.

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[3] Bean, *loc cit.*

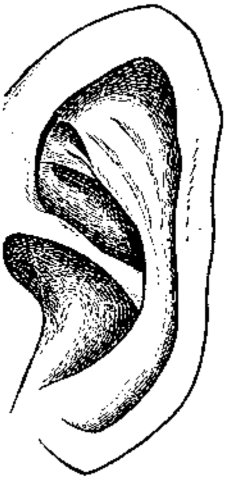

FIG. 6.—The Negroid ear, Filipino; sketch from life.

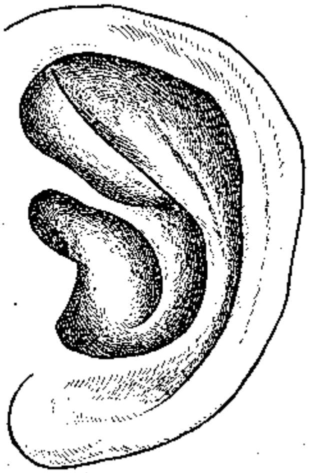

FIG. 7.—The Malay ear. Filipino; sketch from life.

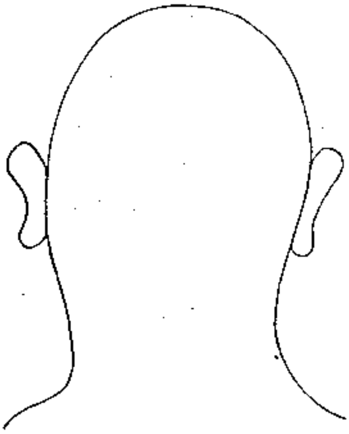

FIG. 8.—Malay ears from behind; sketch from life.

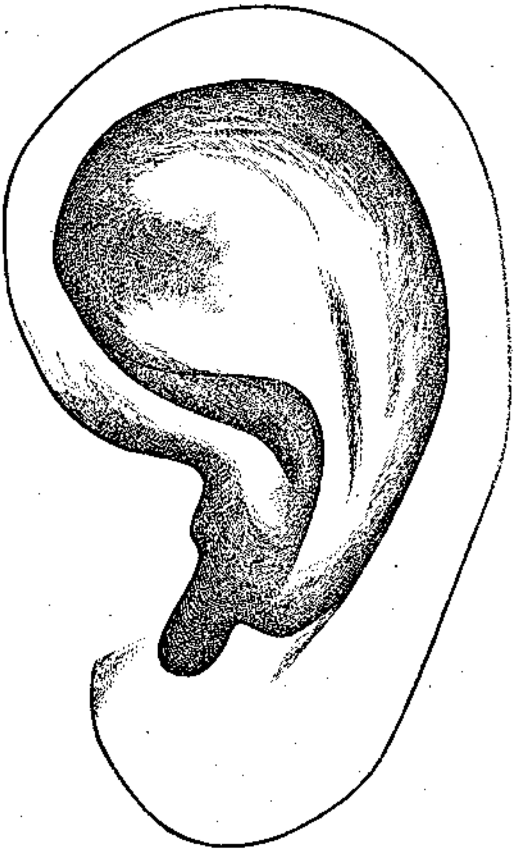

FIG. 9.—The B. B. B. ear. European; sketch from life.

THE B. B. B. EAR (PLATE VI).

This type of ear is smooth, well rounded, clear cut, and even in shape. The helix is rolled above, but flat below, the lobule is flat and broad, although it may be round or pointed. The concha is open, large, and oval, without rounded rim, and the area between the concha and helix is smooth and flat. The ear usually lies close to the head, without any evidence of flaring; it is often square, with rounded corners. The individuals on whom it is most frequently found are medium sized or large, square set, stocky, with a tendency to obesity. The heads are large and oblong in shape. This is one of the most characteristic Spanish types, but is almost universal, and I believe it will be found throughout Europe, Africa, and the East. The ears are located by nationality as follows:

The B. B. B. ear (adult males).

Filipino	108
American	36
Spanish	19
Chinese	3
Mestizo	1
Total	167

Twelve of the Americans are blonde, 1 is redheaded, and 23 are brunette or mixed, with dark hair and light eyes.

Five of the Filipinos are small and stockily built and the remainder are as described above for the type. All have light brown or yellow skins and straight, coarse, black hair, brown eyes, and large, straight, high noses.

THE IGOROT EAR.

This ear has been described by me in another publication.[4] Here it suffices to detail the characteristic individuals on whom it is found. Many are heavy set and stocky, similar to the B. B. B. type, but some are tall. The Chinese present an ear type of great frequency which is similar to that of the Igorot. However, the lobule of the Chinese ear is at right angles to the head, whereas that of the Igorot is more frequently somewhat flattened against it. The ear appears by nationality as follows:

The Igorot ear (adult males).

Filipino	50
Mestizo	9
American	5
Spanish	3
Chinese	2
Japanese	4
Total	73

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[4] *Loc. cit.*

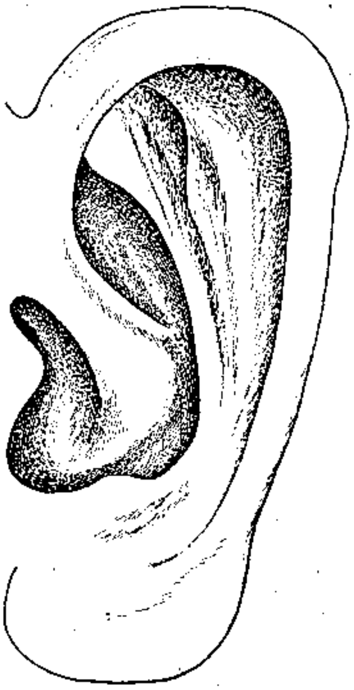

FIG. 10.—The B. B. B. ear. Mestizo; sketch from life.

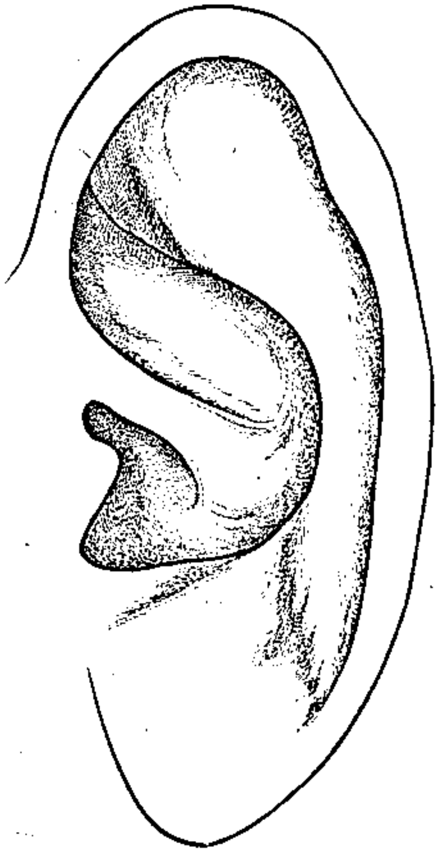

FIG. 12.—The Cro-Magnon ear. Filipino; sketch from life.

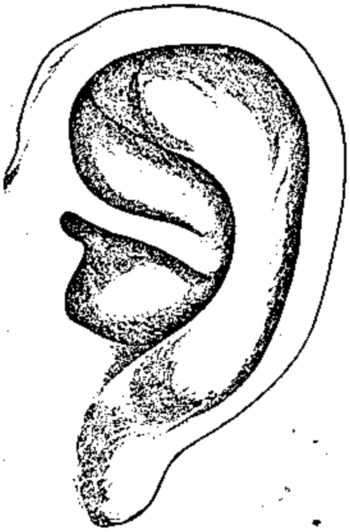

FIG. 11.—The Alpine ear. Mestizo; sketch from life.

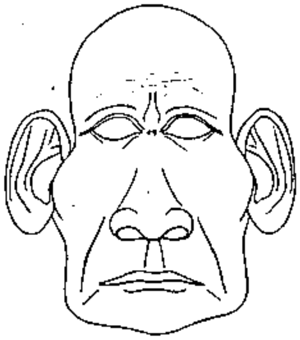

FIG. 13.—Cro-Magnon, Filipino; sketch from life.

All individuals are similar to the B. B. B. except two Filipinos, 7 mestizos, 1 Spaniard, and 1 Chinaman, who are tall.

After careful study I am convinced that the Igorot ear is a modified form of the B. B. B. ear. As such it is well represented by a large element of the priesthood of the Philippines, by Japanese, and by Chinese types similar to the Igorots.

THE ALPINE EAR (PLATE V).

The Alpine ear is the ear of the *fat* man. It is large, round, or oval and without lobule. The helix is continuous around the ear to the lower margin, where it turns forward to terminate in the anthelix and cheek, and thus forms a shelf which is supported by the part of the ear that should be the lobule, but is firmly attached to the cheek. The concha is large and open.

The Alpine ear is related to the B. B. B. on the one hand and to the Malay on the other. The three types shade into each other insensibly. The individuals also resemble each other in size, head shape, and general appearance, which may mean that blending has taken place by continual contact of the types, or that the one is *developed* from the other, the B. B. B. from the Alpine which in turn is derived from the Malay.

Individuals with Alpine ears are usually portly, though not above medium height. They have round heads, flat and broad behind. Their features are full, with especially well-developed parotid glands that may influence the appearance of the ear by everting the lower portion of it. They walk largely along the easy ways of life and frequent the sunny paths.

The Alpine ear is found equally among mestizos and the dark-skinned Filipinos. Its frequency is as follows:

Alpine ear (adult males).

Small, short, fat, stocky, dark skinned Filipinos	46
Large, fat, yellow or white skinned mestizos	39
Short, fat, Spanish	9
Short, fat, American	8
Short, fat, Chinese	2
Tall Filipino	5
Tall American	4
Tall Spanish	1
Tall Chinese	1
Total	115

The jolly, fat, Spanish friar, the American salesman, the French good fellow, the charming celestial all have ears belonging to this type. Music and oratory live in their souls and they constitute to a great extent members of orchestras, bands, and legislative bodies.

THE CRO-MAGNON EAR (PLATE VII).

This ear is the true long ear. It is symmetrical around the base and has a helix and lobule that are equal in size and shape at the two extremities. The descending part of the helix or dorsal border of the ear is straight or gently curved, and is a narrow, round roll, neither broad nor flat. The lobule is large and hangs low to a rounded point. The concha is oval, elongated, and often reaches almost to the helix. The ear stands out well from the head, often at right angles. The individuals to whom this ear is attached are tall brunettes with dysharmonic physiognomy (long head and broad face). They often have a peculiar, wrinkled appearance as if they had dried up and their skin had been left in loose folds. The nose is large and heavy looking. Occasionally an individual with all the appearances of this type except the tall stature may be seen, particularly among the Filipino women.

The following individuals were observed with the Cro-Magnon ear:

The Cro-Magnon ear (adult males).

Tall Filipino	46
Medium Filipino	12
Small Filipino	12
Tall American	13
Tall mestizo	8
Tall Spanish	7
Tall Chinese	3
Total	101

One Filipino with ears resembling the Cro-Magnon, who is tall, rawboned, long headed, big nosed, and wide faced, with square jaws, flaring ears, and hipsistenocephalic head presented an appearance so unusual that I made a hasty sketch on the spot which gives the effect, if not the exact details of the physiognomy. Many individuals similar to this may be seen in the Philippines. (Fig. 13.)

THE IBERIAN EAR. (TYPE *a*) (PLATE VIII).

This ear is round or slightly elongated and stands out from the head. The crest of the helix (superior border) is symmetrical with the lobule; and the whole of the helix is a large, round roll, not flat, sometimes resembling the Malay ear and again the Cro-Magnon. The concha is often slightly everted at the inferior part so that the antitragus projects, carrying with it the lower portion of the anthelix, in this way resembling the Iberian type *b*.

The men of the Iberian type *a* are small, slender, delicately molded, with long heads, black hair and eyes, high, thin, "Roman" noses, and hatchet faces, long and thin, with pointed chin. Among the Filipinos, of course, this type has been modified so that the characteristics are less marked, although occasionally there are true Iberians under brown skins.

Sometimes the men of this type are tall, but in such cases the type is usually not Iberian *a* but Iberian *b*.

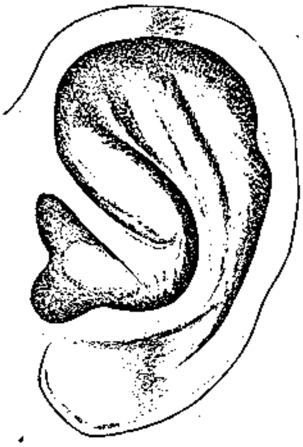

FIG. 14.—The Iberian ear, type *a*. European; sketch from life.

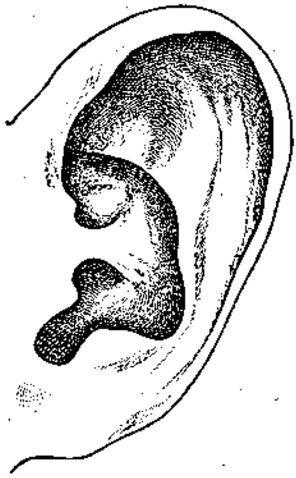

FIG. 15.—The Iberian ear, type *b*. American; sketch from life.

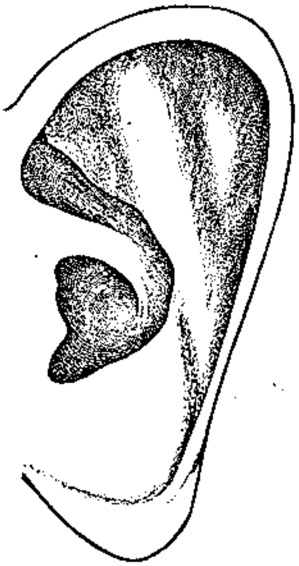

FIG. 16.—The Sub-Northern ear. Chinese; sketch from life.

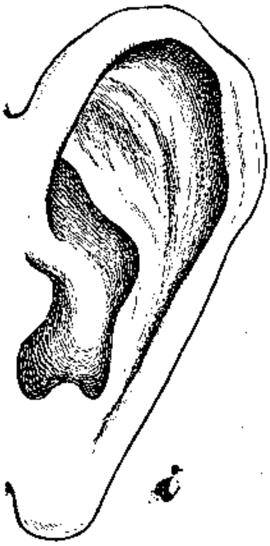

FIG. 17.—The Northern ear. American; sketch from life.

THE IBERIAN EAR (TYPE *b*) (PLATE IX).

This ear is somewhat long and slender, the crest of the helix projects upward and backward; there is no lobule, the lower border of the helix passing diagonally to be joined firmly to the cheek. The eversion of the antitragus and inferior concha is one of the most characteristic features of the ear. The edge of the helix is usually small, thin, and round, and the space between the helix and anthelix is broad above and narrow below, where they come almost into contact.

The men of the Iberian type *b* are almost invariably tall, but otherwise resemble the men of the Iberian type *a*, except that the head is higher and not so long. Among Europeans they may be blonde or brunette.

The following individuals are noted with Iberian ears:

Iberian ears (adult males).

	a	*b*
Small Filipino	68	....
Small Spanish	17	....
Small mestizo	6	....
Small American	1	....
Small Chinese	1	....
Small Japanese	2	....
Tall Filipino	5	7
Tall mestizo	4	2
Tall Chinese	1	....
Tall European	....	3
Total	105	12

THE NORTHERN EAR.

The Northern ear is seldom seen upon a Filipino, but is often found on Chinamen, as noted later.

The Northern is a long, oval, flaring ear with slender helix and small lobule. The distance between the helix and anthelix is great above and small below. The concha is irregularly oval in shape and the antitragus is sometimes slightly everted, thus resembling the Iberian ear. Europeans with this ear are tall and blonde with long heads, and these characteristics, except the coloring, impress themselves upon the Chinese and the Filipinos who have the Northern ear.

Northern ear (adult males).

Tall mestizo	5
Tall American	3
Tall Filipino	1
Tall Chinese	1
Total	10

AN ODD TYPE.

Once, when riding through Malate on the street car, I was startled by seeing an old Filipino with a most peculiar ear. The old man was small, slender, wizened, and almost baldheaded, with skin like old, washed leather. He had a short, flat nose, broad upper lip, and projecting jaws. His head sloped almost directly from heavy brow ridges to the wide parietal region, being narrow in front and flat on top and behind. The ear was triangular in shape, straight out from the head above, and from the upper border the helix passed diagonally downward and inward to the cheek, where it was firmly attached without intervening lobule. The upper border of the ear presented the form of a scroll as indicated by sketches hastily made at the time. (Fig. 19.)

Since then I have seen six men of similar type, although not so pronounced in the physical characteristics. I am inclined to believe this is an aboriginal and not a pathologic type, because the Malay and Negroid ears, although different in detail resemble this ear in some particulars. These three types of ears resemble one form of Negro ear in America as portrayed by Hrdlicka.[5]

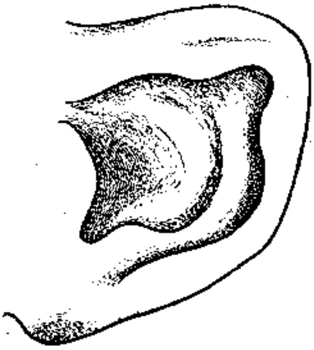

FIG. 18.—Negro ear (Hrdlicka); copied from photograph.

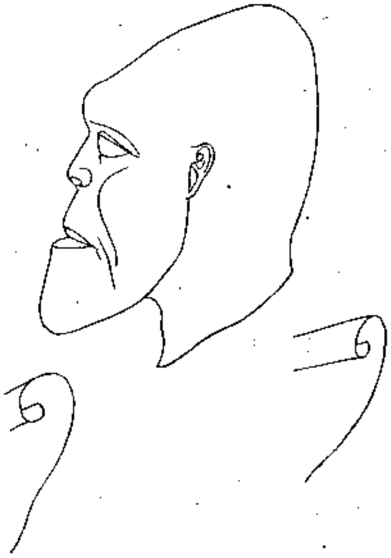

FIG. 19.—An odd type. Filipino; schematic sketch from life.

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[5] Hrdlicka, A.: Anthropological Investigations on One Thousand White and Colored Children of Both Sexes. The Inmates of the New York Juvenile Asylum.

BLENDED EARS.

Blends of infinite variety are continually noticed, and many ears are of such a nondescript character as to be difficult of classification. The European types of ears found upon the Filipinos resemble closely the corresponding European types, although the skin of the Filipino with European ears may be brown, and other characters of the Filipinos are not so truly European as the ears. This indicates that pure types of ears do not blend so readily as other characters, such as skin color, and the European ears grafted on the Filipino remain true to type, but slowly taking on the characteristics of the native as generations pass.

CHINESE EARS (PLATE X).

The Chinaman's ears are more largely European than those of the Filipino, and the same European ear types appear among the Chinese as among the Filipinos, although among the Chinese the European ear types are not so distinctly European as among the Filipinos. Judged by ear types the Chinese are more completely amalgamated than the Filipino and they have a larger proportion of European elements fused into their composition. The majority of the Chinese noted are in the shops along both sides of Calle Rosario and vicinity. The following table gives the types of Chinese ears observed:

Chinese ears (Adult males).

Negroid	107
Alpine	71
Igorot	46
B. B. B.	39
Northern	31
Sub-Northern	64
Iberian *a*	31
Malay	29
Iberian *b*	18
Cro-Magnon	14
Others	97
Total	547
No lobule	199
Long ears	213
Short ears	185

Among the Chinese, as among the Filipinos, the Negroid ear predominates, which points to a common origin for a portion of the two peoples. The Northern and Sub-Northern types appear frequently among the Chinese, but are rare among the Filipinos. The Sub-Northern ear is a characteristic Chinese ear and it is called Sub-Northern because it occurs on tall, long-headed Chinamen, with long, narrow faces. It stands almost at right angles to the head in its lower half, which is oblong and similar to the lobe of the Igorot ear or of the B. B. B., except that these two are usually parallel to the head, or at a more acute angle than 90 degrees.

The types of Chinamen corresponding to the ear types are in all particulars (with slight differences) like the types described under Filipino ears. A greater number of Chinese than of Filipinos are tall, and not so many of the Chinese are stocky. The relative proportion of each type among the two peoples may be of interest.

Chinese versus Filipino ear types, by percentages.

Type.	Filipino number.	Chinese number.
B. B. B	15	7
Negroid	14	20
Igorot	13	9
Malay	10	5
Alpine	7	13
Cro-Magnon	6	2
Iberian *a*	5	5
Iberian *b*	1	4
Others	29	19
Northern		5
Sub-Northern		11
Total	100	100
No lobule	23	38
Long ears	37	40

The Chinese have a greater percentage of Negroid, Alpine, Iberian *b*, Northern and Sub-Northern ears, and ears without lobules; the Filipinos have a greater percentage of B. B. B., Igorot, Malay, and Cro-Magnon ears, and each people has an equal number of Iberian *a* ears. The number of long ears is great in both people, but slightly less among the Filipinos. It is not possible to know from a random sample of the population that the types are present in the exact proportion designated, but the presence of the Igorot, the Malay, and the B. B. B. (Spanish) types in the Philippines among the non-Christian tribes leads me to believe that the three types are more frequent among the Filipinos than among the Chinese.

SPANISH EARS.

The ears of the Spaniards in Manila are largely of two types, the Iberian *a* and the B. B. B., although the Alpine ear is of frequent occurrence, but partakes of the characteristics of the B. B. B., with which it is blended so that the line of demarkation is slight. The Cro-Magnon ear must claim attention also because of its frequent occurrence.

Spanish ears.

B. B. B.	52
Iberian *a*	48
Alpine	33
Cro-Magnon	25
Iberian *b*	13
Igorot	11
Northern	2
Others	21
Total	205

The individual physical characteristics of the men agree with previous descriptions of the physical types; the ear type and the physical type coincide more nearly than among the Filipinos. The types of ears and of individuals are purer among the Spanish than among the Chinese or the Filipinos because there is no confusion of Negroid and Malay among the Spanish. There is more or less blending of the different types so that an Iberian ear may resemble the Igorot or Cro-Magnon, or one of the other types, but is none the less distinctly Iberian in character. So with the other types. The Iberian and Cro-Magnon are more often similar to each other than to other ears and the Alpine and B. B. B. are in the same category. The Northern ears are not found among the Spanish on blondes, but on brunettes. The "others" are composites or blends of the various types. The Igorot ear is European, as it is found on Spaniards.

EAST INDIAN EARS.

The ears of a few Indian merchants on the Escolta were examined, also the ears of a few Sikh night watchmen. The latter are all except two (7–2 =5) Cro-Magnon ears. The two are divided into one B. B. B. and one belonging to the class termed "others."

Adult male East Indian ears.

B. B. B.	9
Cro-Magnon	7
Iberian *a*	6
Igorot	5
Malay	2
Others	4
Total	33

One important feature of the Indian ears is the remarkably pure European types among them, purer than the Chinese or the Filipino. The skin of the Indians is usually darker than that of the other two peoples, but their features are more like the European than are those of the Chinese or Filipinos. It is to be noted that only four European types occur among the Indians, but the whole number might reveal more of other types. If one may reason from so small a number, and the purity of ear type and physical type make it justifiable, there appear to be Europeans under brown skins among the Indians, and occasionally a Malay is found. The brown skin could be due to implantation of the European on the Negrito and persistence of the brown color by selection aided by the tropical sun; the European traits to early prehistoric migrations of white men from Europe. The mingling of the European and Negrito resulted in the retention of useful characters, the color of the Negrito and the form of the European.

FEMALE FILIPINO EARS.

The difficulty of observing the ears of the women because of the hair renders the collection of data limited and not easy, therefore only 144 individuals are noted.

Adult female Filipino ears.

Negroid	48
Malay	18
Chinese [Sub-Northern[	16
Cro-Magnon	16
Igorot	14
B. B. B.	10
Alpine	7
Iberian	0
Others	15
Total	144

The female ear is esentially long, longer than that of the male, and the lobe is more pendent. There are 56 long ears and 25 short ears among the women, besides the Negroid ears which are longer for the women than for the men. Absence of the Iberian ear may be significant, or it may be because so few individuals were observed. The accumulated evidence indicates that some of the precursors of the present Filipinos were long eared and the long-eared precursors were Mongolians and Europeans. The Cro-Magnon, the Sub-Northern, the Igorot, the B. B. B. ears are long ears; the Malay and the Iberian are short ears, also the Alpine and Negroid. If the women represent the primary stocks and the men represent the invaders, then the primary stocks had less Iberian and Alpine, more Negroid and Cro-Magnon than the invaders, and Iberian and Alpine ears are more recent grafts on the Filipino than Negroid and Cro-Magnon. In other words, there were more Negroid and Cro-Magnon elements among the peoples of the Philippines before the Spanish came, and the Spanish introduced among the Filipinos a greater proportion of Alpine and Iberian than had previously existed.

THE MORPHOLOGY OF THE FILIPINO EAR.

The morphological differences in the types of Filipino ears are of significance if our present knowledge of the developmental history of the ear is accepted to indicate that the human ear is undergoing retrogade metamorphosis.

Schwalbe[6] demonstrates the similarity of the ear of human embryos at 4 to 6 months intra-uterine life to the ear of *Macacus rhesus* and *Cercopithecus cngythita*, one of the chief points of resemblance being the absence of the inrolled rim of the helix. This author further states (p. 188): "Vom 8 Monat an beginnt ein Reduktionsprozess der Ohrfalte, welcher sich im wesentlichen in Einrollung des Oberrandes und stärkerer Ausbildung des Anthelix Systems ausprägt." When the adult human ear has attained its full maturity, the rim of the helix has rolled inward and forward, and the tip of the ear forms Darwin's tubercle. The extent of inrolling of the helix marks the grade of development and evolution of the ear, hence the age in the world's time of the ear type.

The types of ears under observation may be conveniently grouped into three classes:

1. Old types which have much inrolled helices, and everted anthelices.
2. Intermediate types which have rolled helices but not so marked as in old types, and
3. New types with slightly rolled helices and depressed anthelices resembling the ear of the embryo.

The Negroid and Malay ears are old types, the Cro-Magnon and Iberian ears are intermediate, the Igorot and B. B. B. ears are new types. The others are mixed, intermediate, and new. By this criterion the Filipinos are older than the Chinese, Indians, or Spanish because they have older ear types, at least a greater proportion of Filipinos than of the other peoples have old ear types. Portions of the Filipino, Chinese, and Indian populations have old ears and portions have new and intermediate forms, therefore, the three peoples were originally of the same stock, and have since received similar infusions of new stocks, although in varying proportions as regards type.

BILIBID TYPES (SEE TABLE AT END).

The inmates of Bilibid Prison are of two kinds—local, short-term prisoners, or those from the neigborhood of Manila who are serving terms of less than five years; and general, long-term prisoners, or those from all parts of the Philippine Islands except a part of the Moro dominions, who are serving terms of five years or over. The latter are representative

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[6] Schwalbe, G., Das Darwinsche Spitzohr beim Menschlichen Embryo.—*Anatomischer Anzeiger.* (1889), 4, No. 6, 176 to 189.

Filipinos of the lower class, and for that reason I examined a large number of their ears with the following results:

Bilibid adult male Filipino ears.

Malay	160
Negroid	98
Cro-Magnon	61
Alpine	56
B. B. B.	40
Iberian *a*	31
Igorot	26
Iberian *b*	8
Others	386
Total	866

It must be said that this classification is somewhat misleading when compared with previous classifications because the prisoners are very rarely pure types, and those classed as Cro-Magnon, Alpine, B. B. B., Iberian *a* and *b* and Igorot have ears that merely resemble these types, and show traces of other characters. The large number of "others" indicates that many ears are unclassifiable in classes selected. Many—probably the majority—of "others" are blends of the various types, but some are types not yet described. Seventy-three of the "others" resemble the Chinese ear with large, flaring lobule (Sub-Northern).

The Bilibid types should be compared by percentages with the pedestrians of a previous classification (page 31) since they both represent Filipinos of the lowly walks of life.

Ears of Bilibid prisoners and Manila pedestrians, by percentages.

Type.	Pedestrians.	Prisoners.
Negroid	18	11
Malay	15	18
Igorot	10	3
B. B. B	8	5
Cro-Magnon	5	7
Iberian *a*	5	4
Alpine	4	6
Iberian *b*	2	1
Others	33	45
Total	100	100

The significant feature of this comparison is that the percentages are nearly equal in the two groups, although there is a greater per cent of Malay and others and a smaller per cent of Negroid, Igorot, and B. B. B. among the prisoners than among the pedestrians. When the prisoners are contrasted with the riders of a previous classification (page 31) the similarity is not so great.

Ears of Bilibid prisoners and Manila riders, by percentages.

Type.	Riders.	Prisoners.
B. B. B	24	5
Igorot	17	3
Alpine	12	6
Cro-Magnon	7	7
Negroid	7	11
Iberian *a*	6	4
Malay	4	18
Iberian *b*	1	1
Others	22	45
Total	100	100

The difference between these two groups is that the European types of Filipino constitute 65 percent of the riders whereas the Malay, Negroid, and others, constitute 74 percent of the prisoners. The Filipino prisoners of Bilibid are less European in their composition than the riders of Manila, and more like the pedestrians, but they have even less European than the pedestrians.

Photographs of inmates of Bilibid Prison selected to represent the various types are reproduced, and may be examined by reference to Plates IV to X. The photographs for Plates I, II, and III were made by Mr. Martin, of the Bureau of Science, the remainder by the official photographer at Bilibid Prison. The drawings throughout this work were executed by Mr. W. Schultze, of the Biological Laboratory, who has my sincere thanks for his personal attention to their production.

SUMMARY.

The Chinese, the Indian, the Manila rider, the Manila pedestrian, and the long-term Bilibid prisoner represent groups of men undergoing the process of fusion of similar elements and each group is a different stage of transition in the fusion process. The long-term Bilibid prisoners have less European elements than the other groups, and the European is more obscurely mixed; the Chinese have less Malay than the other groups and the European elements predominate, obscuring the remainder. Between the Chinese and the long-term Bilibid prisoners the other groups have variable proportions of the different elements, but the Indians, the Manila riders and pedestrians represent more recent minglings of the types than the Chinese and Bilibid prisoners. Among the first three groups the engrafting of Europeans is more recent than in the last two, therefore the blending has not advanced so far and more definite European types are encountered, but in the last two groups it is more difficult to detect pure European types, although the majority of the Chinese resemble Europeans more than do the majority of the prisoners.

Among the prisoners there is evidence of at least four old types besides the European types of more recent date (neolithic and later). The four are the Malay, Negroid, Cro-Magnon, and a type similar to the odd type previously described. This odd type impressed itself on the Filipino ear to a large extent by the absence of lobule, the horizontal superior border to the helix, and the flare of the ear, but the type itself is extremely rare. The following scheme seems plausible: This odd form, represented in the earliest inhabitants of the Islands, was superseded by the Cro-Magnon type and later in conjunction with another primitive European type, the early Iberian mingled with the Negrito and peopled the Islands to some extent. Still later another infusion of fused Europeans (Iberian, Alpine, B. B. B.) and Negritos came into the Islands; and these mingling types produced the Bilibid prisoner. In more recent times the modern European has impressed the Filipino, especially in the vicinity of Manila, and produced the pedestrians and riders. According to my scheme for heredity[7] the three groups of Filipinos, riders, pedestrians, and Bilibid prisoners, represent three successive stages in the blending of the European and the Filipino. The riders are in the stage of beginning blending, where the pure types persist; the pedestrians are in a stage farther advanced although a few pure types still appear; and the Bilibid prisoners are in the stage of a variable blend with all shades of intervening variations between the types, but no pure types.

The Indians are in a stage close to that of the riders where the blend is progressing, but the pure types persist, whereas the Chinese are more advanced than are the Bilibid prisoners toward a complete blend, with a much larger proportion of European than any of the Filipino groups, and probably more than the Indians; but the Chinese are composed of European types some of which are different from those that have blended in the Indian and Filipino.

If similarity of ear form indicates the degree of relationship, then on the one hand the Malay type is related to the Negroid, which is related to the Alpine, which is related to the Igorot, which is related to the B. B. B.; and on the other hand, the Malay is related to the Iberian *a*, which is related to the Iberian *b*, which is related to the Cro-Magnon, which is related to the Sub-Northern, which is related to the Northern. These relationships may indicate the relative order of the types in evolution, or what is more probable, the degree of intimacy or time of contact of the types, hence the amount of blending. The types "on the one hand" are different from the types "on the other hand."

The ear types, Malay, Negroid, Cro-Magnon, etc., may not be characteristic of the Malay, Negro, and Cro-Magnon man, etc., but all the types portrayed in this paper are definite types of ears and they are found on definite physical types of men.

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[7] *This Journal, Sec. A.* (1908), 3, 215.

INFERENCES.

Types of human ears are established for the first time, and each ear type is associated with a physical type of man.

The majority of Filipino ears examined in Manila and vicinity are similar to European ears, but the majority of Filipino ears examined in Bilibid Prison on long-term inmates from all parts of the Islands except the Moro Province are not so much like European ears.

The types of ears not of European origin are morphologically older than the European ears.

The Spanish population of Manila has ear types which are closely simulated in the European types among the Filipinos.

The Chinese influence on the Filipino is evident in ear form as in other characters.

Prehistoric Europeans have probably affected the Filipino ears to some extent.

Chinese and Indian ears exhibit types similar to those of the Filipino, but different from them because of the difference in time during which the amalgamation has progressed, and because some of the types entering into the composition of one people are not found in the others.

The Chinese ears are longer than the European, Filipino, or Indian, probably because the Chinese population is composed more largely of the long-eared European types (Northern, Sub-Northern, Cro-Magnon).

Ear type seems to be independent of pigmentation to some extent, because the same type of ear is found on blonde and brunette Europeans, on dark-skinned and light-skinned Filipinos, and on dark-skinned Indians and light-skinned Chinese.

TABLE I.—*Types of Bilibid prisoners.*

No.	Nativity.	Age.	Term of imprisonment.	Stature.	Reach.	Trunk.	Head length.	Head width.	Bizygomatic.	Ear length.	Ear type.
2040	Iloilo	32	10 years	144	-----	-----	-----	-----	-----	-----	Alpine.
2150	Cebu	22	22 years	156	-----	-----	-----	-----	-----	-----	Cro-Magnon.
2276	Manila	22	16 years	156	-----	-----	-----	-----	-----	-----	Alpine.
2802	Ilocos Sur	23	30 years	167	-----	-----	-----	-----	-----	-----	Northern.
3202	Tayabas	31	25 years	167	177	88	18.8	15.3	14.6	7	Cro-Magnon.
3426	Laguna	26	20 years	168	-----	-----	-----	-----	-----	-----	Iberian *b*.
3851	Isabela	28	10 years	171	-----	-----	-----	-----	-----	-----	Do.
3865	Samar	20	12 years	147	-----	-----	-----	-----	-----	-----	Malay.
3958	Leyte	18	25 years	162	-----	-----	-----	-----	-----	-----	B. B. B.
4012	Bohol	28	20 years	160	-----	-----	-----	-----	-----	-----	Alpine.
4048	Bulacan	25	do	166	-----	-----	-----	-----	-----	-----	Iberian *a*.
4367	Manila	46	12 years	161	-----	-----	-----	-----	-----	-----	Cro-Magnon.
4848	Pangasinan	18	do	142	-----	-----	-----	-----	-----	-----	Negroid
5013	Batangas	59	Life	166	-----	-----	-----	-----	-----	-----	Cro-Magnon.

TABLE I.—*Types of Bilibid prisoners*—Continued.

No.	Nativity.	Age.	Term of imprisonment.	Stature.	Reach.	Trunk.	Head length.	Head width.	Bizygomatic.	Ear length.	Ear type.
5017	Mindoro	19	Life	153	----	----	----	----	----	----	Malay.
5060	Laguna	20	20 years	157	----	----	----	----	----	----	Iberian *a*.
5334	Iloilo	36	do	158	----	----	----	----	----	----	Negroid.
5450	Misamis	28	30 years	157	----	----	----	----	----	----	Iberian *a*.
5453	do	28	do	157	----	----	----	----	----	----	Malay.
5517	Iloilo	19	20 years	150	----	----	----	----	----	----	Do.
5701	Laguna	56	do	162	----	----	----	----	----	----	Cro-Magnon.
5715	Batangas	45	10 years	166	176	88	18.7	15.6	14.8	6.4	B. B. B.
5770	Samar	35	14 years	138?	----	----	----	----	----	----	Malay.
5909	Antique	35	12 years	155	161	84.6	18.9	15	14.4	5.6	Do.
5936	Nueva Ecija	26	8 years	158	164	84.3	17.7	15.2	14	6	Alpine.
5958	Manila	41	Life	173	171	91.5	19.5	15.4	14	6.9	Cro-Magnon.
5970	Laguna	44	do	172	172	95.2	18.9	16.1	15.2	6.6	B. B. B.
6161	Leyte	18	25 years	156	164	86	17.6	15	15	5.5	Malay.
6260	Ilocos Sur	20	7 years	169	174	89	18.6	15.2	13.7	6.4	Alpine.
6278	Leyte	25	25 years	161	168	86.5	17.6	16.2	14	6.4	Negroid.
6328	do	31	20 years	166	177	86.2	17.9	14.8	13.7	6.3	Malay.
6511	Manila	28	7 years	169	173	87.7	18.6	15.1	14.2	6.7	Cro-Magnon.
6534	Leyte	21	20 years	149	154	82.6	18.4	15.5	13.6	6	Iberian Malay.
6610	Nueva Ecija	28	9 years	169	173	90.1	17.7	15.1	13.7	6	Iberian *a*.
6742	Laguna	23	6 years	156	160	81.7	17.8	15	14	5.8	Malay.
6747	Cavite	31	Life	166	----	----	----	----	----	----	
6749	do	20	do	156	160	81	17.4	14.4	13.9	5.3	Iberian *a*.
6930	Bulacan	27	16 years	164	172	85.3	19.4	15.6	14	5.8	Mestizo.
6985	Pampanga	46	18 years	171	178	93	18.1	14.3	14	7.5	B. B. B.
7100	Borongan	25	20 years	148	155	80.7	18.2	15.7	14.8	5.8	Malay.
7156	Pangasinan	38	Life	167	174	90.5	17.6	16	14	6.8	Sub-Northern.
7218	Capiz	38	12 years	162	164	85.3	17.3	14.9	13.2	6.3	Alpine.
7264	Tayabas	19	20 years	152	161	82.1	17.3	14.8	13.3	6.2	Malay.
7306	Samar	20	17 years	152	155	82	16.9	15.6	14	5.6	Negroid.
10279	Rizal	22	(?)	165	174	86.3	17.9	14.8	18	4.7	Iberian *b*.
13020	Albay	23	4 years	165	177	86.5	19.1	16.1	14.2	6.2	Alpine.
13120	Bulacan	18	2 years	151	151	82	17.4	15.2	13.3	5.6	Iberian *a*.
13734	Cebu	31	do	157	162	87.4	18.5	16.3	14.3	6	Alpine.
13885	Negros	29	do	152	155	83.6	17.4	14.7	13.9	5.5	Malay.
14085	Manila	19	1 year	150	150	83.5	19.8	13.1	13	5.8	Iberian Malay.
14183	do	20	6 months	165	174	86.3	17.9	14.8	13	4.7	Iberian *b*.
14202	Bulacan	18	2 years	151	154	82.1	17.4	15.2	13.3	5.6	Iberian *a*.
14499	Manila	44	1 year	157	163	89	19.7	15	14.2	6.9	B. B. B.
14583	Nueva Ecija	31	4 months	167	174	87.8	18.8	15.4	14.2	7	Sub-Northern.
14655	Laguna	30	4 years	159	163	86	18	15.4	13.7	5.7	Iberian *a*.
14783	China	32	6 months	----	----	----	----	----	----	----	Sub-Northern.
14811	Manila	25	2 months	159	164	86.5	18	15.2	14	7.1	Alpine.
14857	Ambos Camarines.	53	4 years	153	155	84.5	19.1	15.4	13.5	6.7	Cro-Magnon.
14867	Manila	35	2 months	160	166	88	18.6	14.7	14	6	Do.
14882	Samar	30	2 years	159	163	87.5	18.2	15.6	14.6	5.9	Negroid.
14957	Manila	40	3 months	165	170	88.2	18.5	15.3	14.6	7	Cro-Magnon.
14964	China	41	1 month	----	----	----	----	----	----	----	Do.
15006	Bulacan	18	4 months	168	170	89.3	18.2	15.1	13.4	6.1	Iberian *a*.

TABLE II.—*Averages for the various types of Bilibid prisoners.*

Ear type.	Number.	Age.	Stature.	Ear length.	Head length.[a]	Head width.	Cephalic index.	Bizygomatic.
Cro-Magnon	10	41	163	6.7	18.9	15.2	80	14.2
Iberian *a*	11	23	157	5.8	18	14.9	83	13.5
Iberian *b*	4	24	167	4.7	17.9	14.8	83	13
Malay	12	25	153	5.8	17.9	15	84	14
Negroid	5	26	157	6	17.6	15.8	90	14.2
Alpine	9	27	159	6.3	18.2	15.3	84	13.9
B. B. B	5	39	166	6.9	18.9	15.3	81	14.6

[a] The head length is measured from the nasion to the maximum occipital protuberance.

ILLUSTRATIONS.

Plate I. The Malay ear.
II. The Malay ear. Modified.
III. The Malay ear. Modified.
IV. The Malay ear.
V. The Alpine ear. Modified.
VI. The B. B. B. ear. Modified.
VII. The Cro-Magnon ear. Modified.
VIII. The Iberian ear (Type *a*). Modified.
IX. The Iberian ear (Type *b*). Modified.
X. The Chinese ear.
Fig. 1. (In the text.) Type 1.
2. (In the text.) Type 2.
3. (In the text.) Type 3.
4. (In the text.) Type 4.
5. (In the text.) Type 5.
6. (In the text.) The Negroid ear. Filipino. Sketch from life.
7. (In the text.) The Malay ear. Filipino. Sketch from life.
8. (In the text.) Malay ears from behind. Sketch from life.
9. (In the text.) The B. B. B. ear. European. Sketch from life.
10. (In the text.) The B. B. B. ear. Mestizo. Sketch from life.
11. (In the text.) The Alpine ear. Mestizo. Sketch from life.
12. (In the text.) The Cro-Magnon ear. Filipino. Sketch from life.
13. (In the text.) Cro-Magnon Filipino. Sketch from life.
14. (In the text.) The Iberian ear, type *a*. European. Sketch from life.
15. (In the text.) The Iberian ear, type *b*. American. Sketch from life.
16. (In the text.) The Sub-Northern ear. Chinese. Sketch from life.
17. (In the text.) The Northern ear. American. Sketch from life.
18. (In the text.) Negro ear.—Hrdlicka. Copied from photograph.
19. (In the text.) An odd type. Filipino. Schematic outline from life.

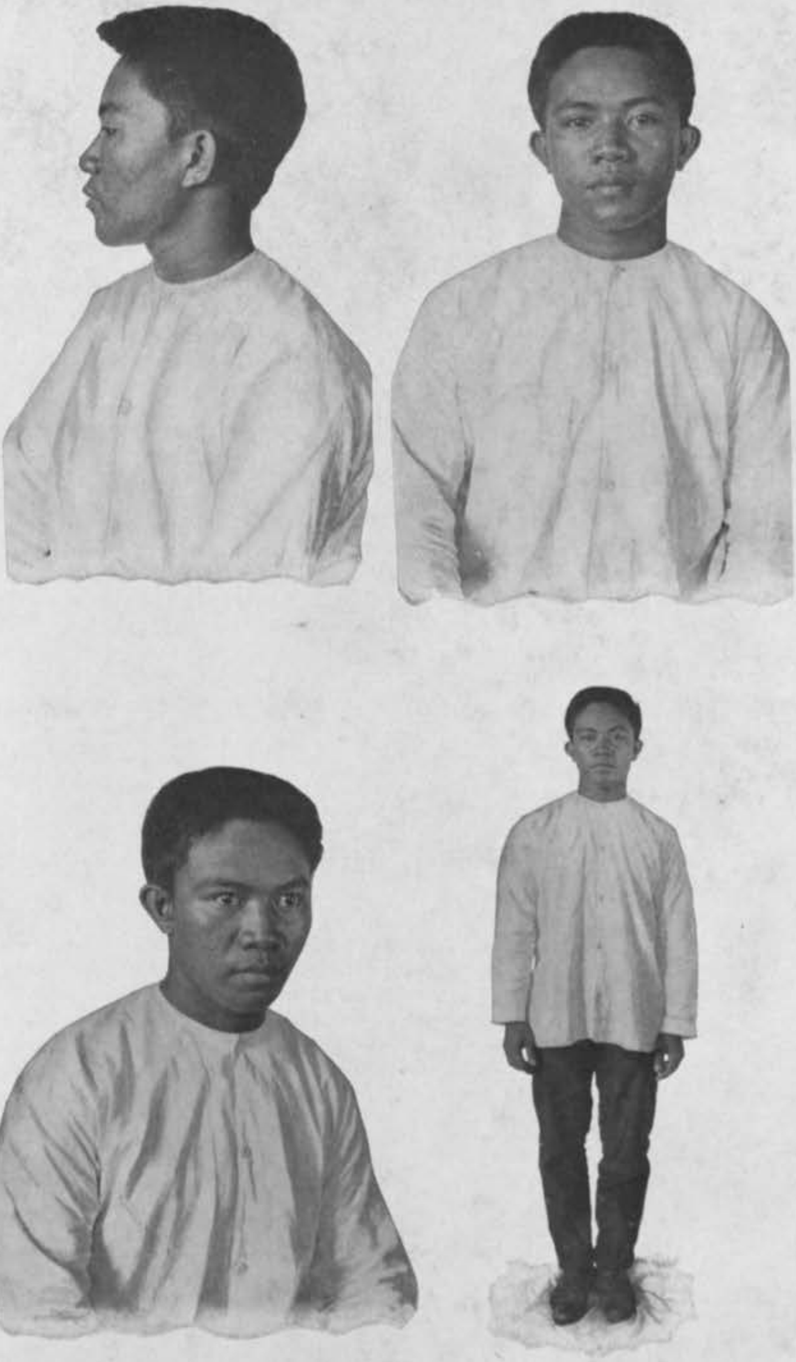
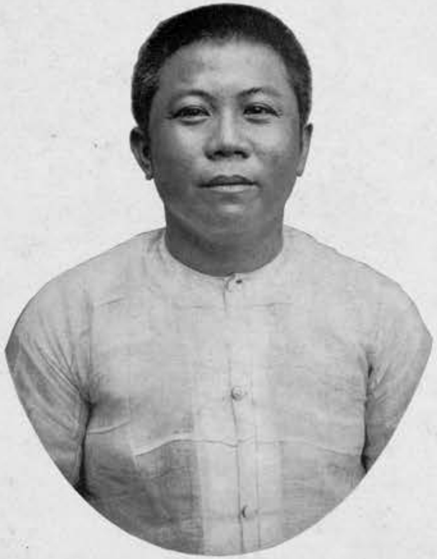


PLATE I.



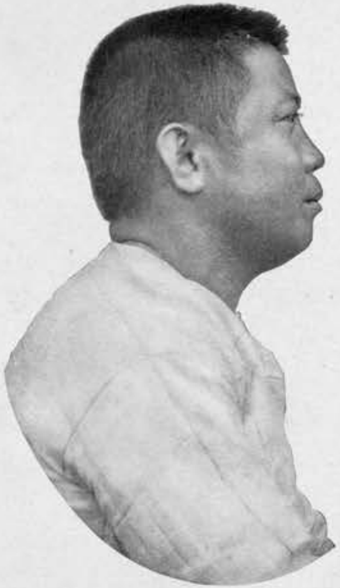


PLATE II.

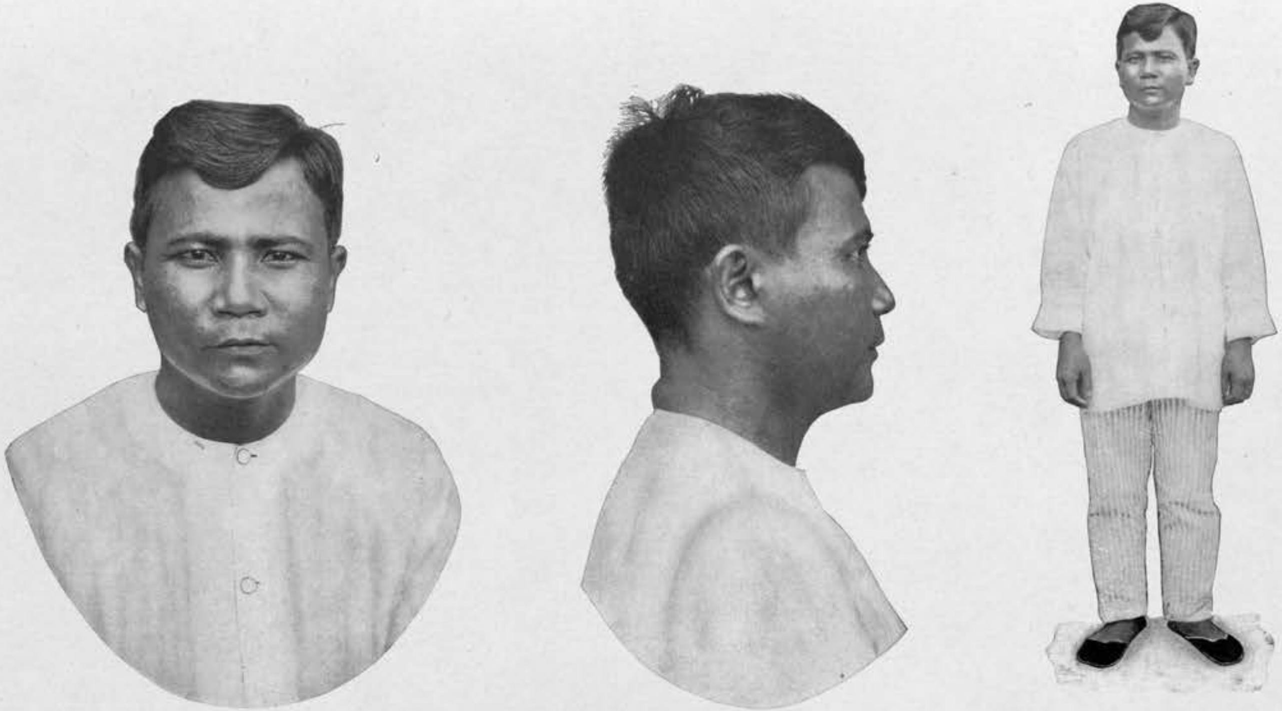


PLATE III.

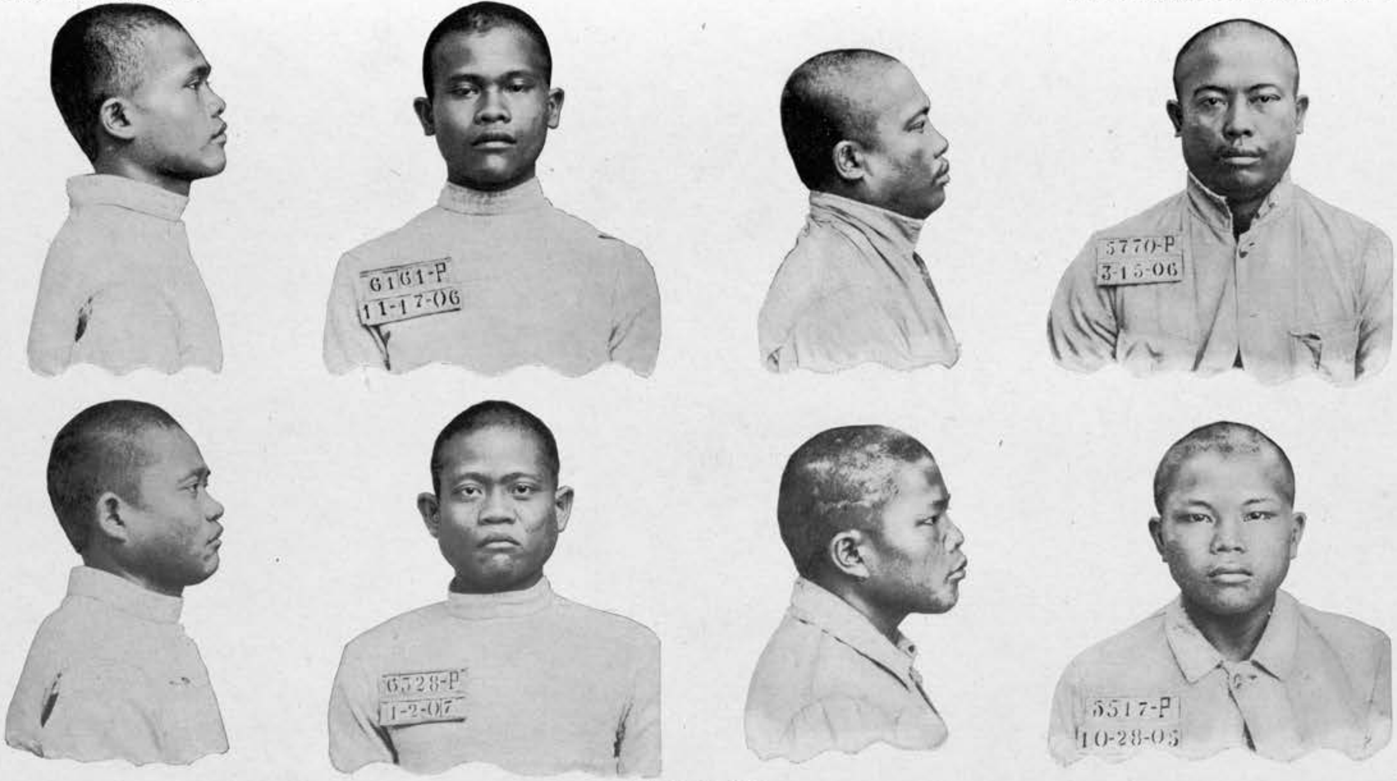


PLATE IV.

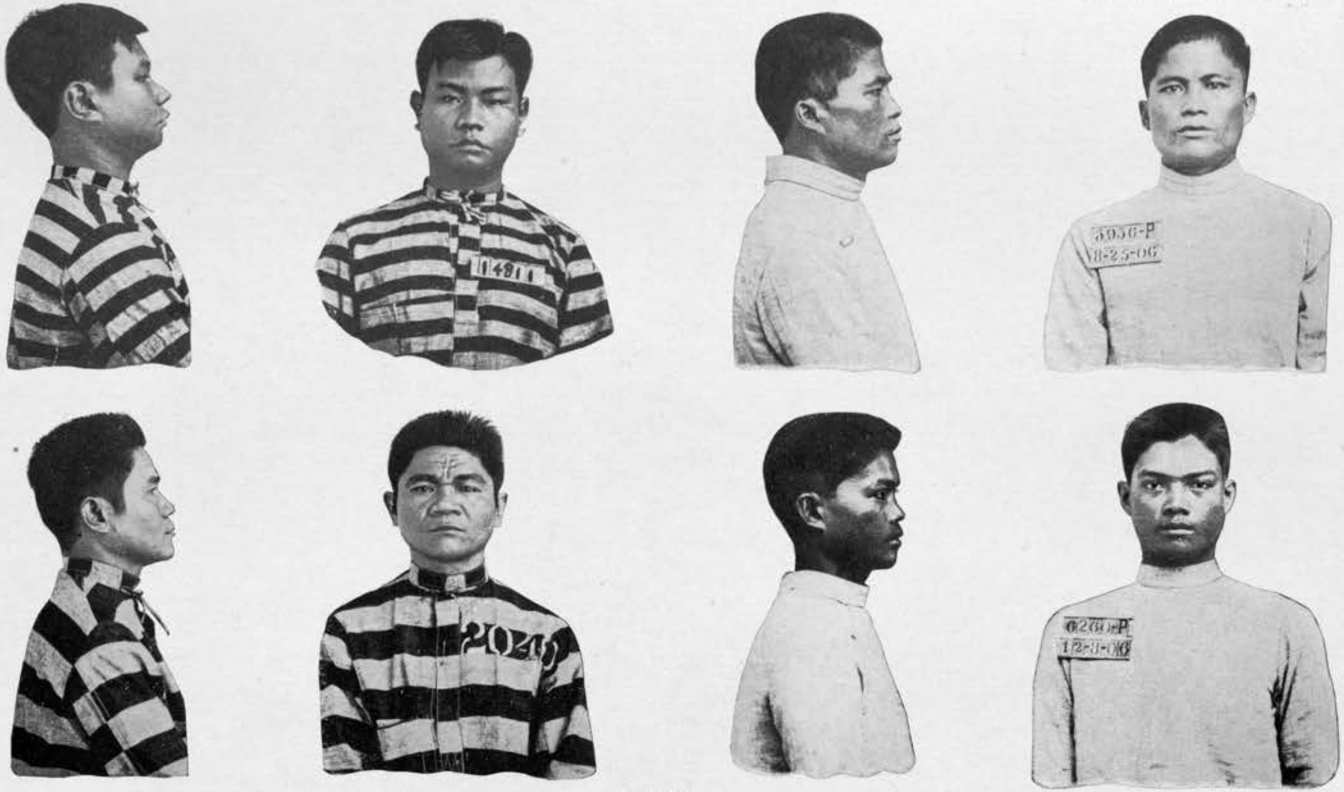


PLATE V.

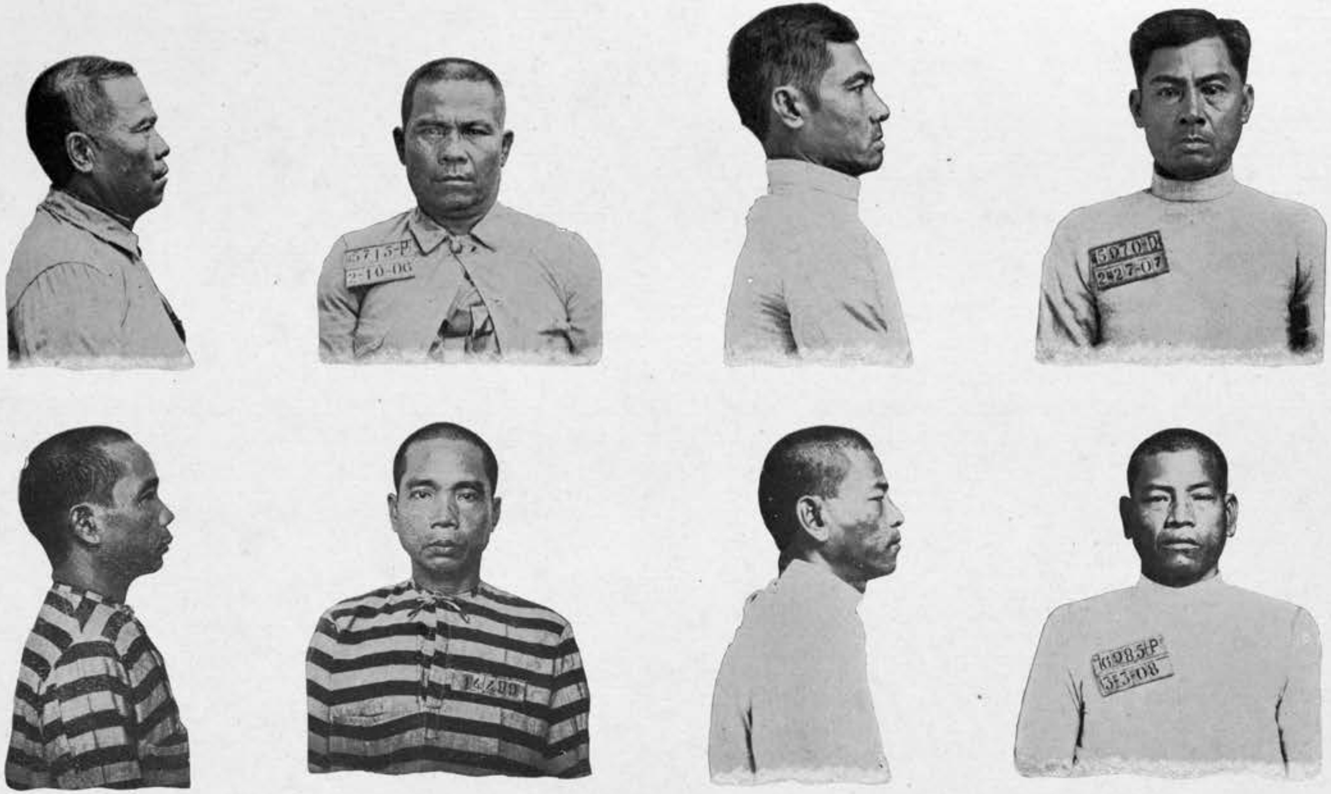


PLATE VI.

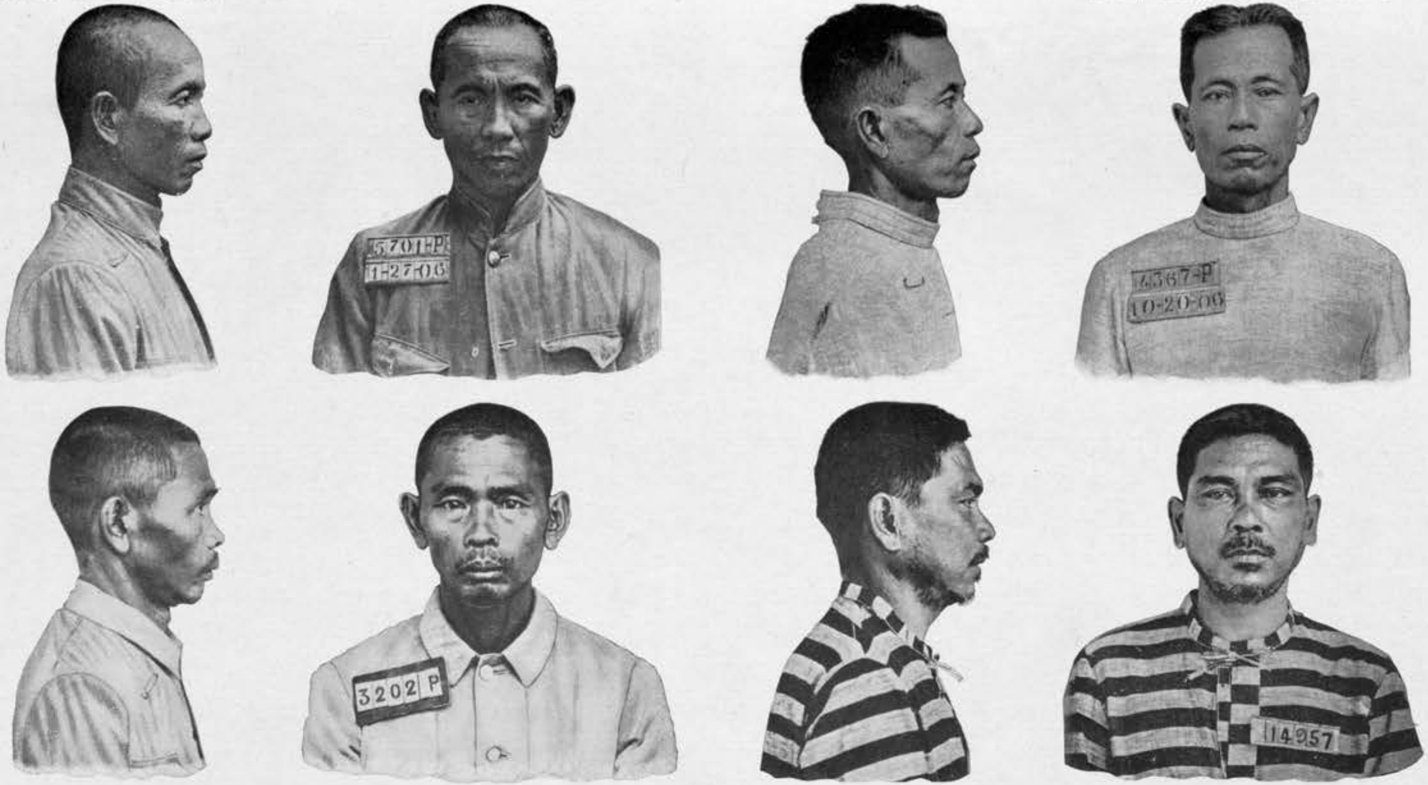


PLATE VII.

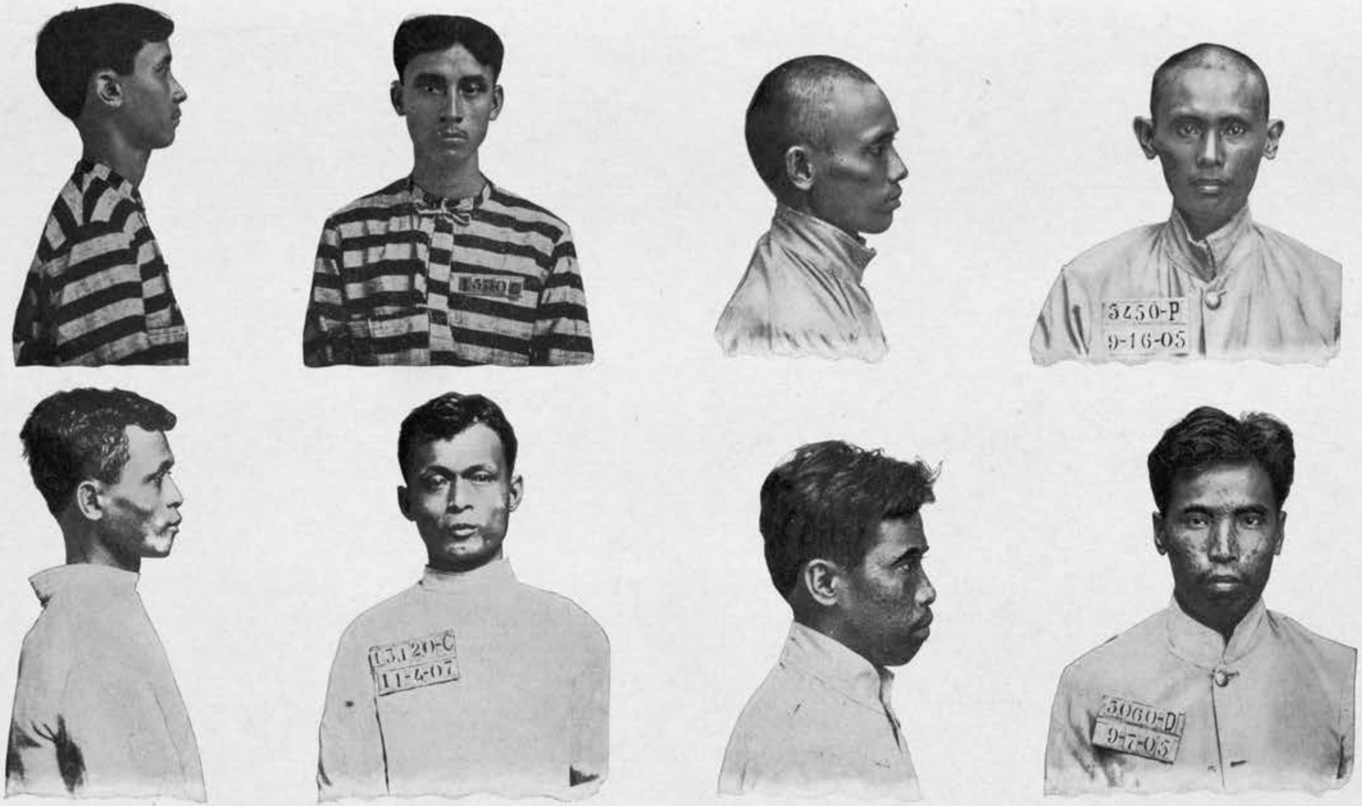


PLATE VIII.

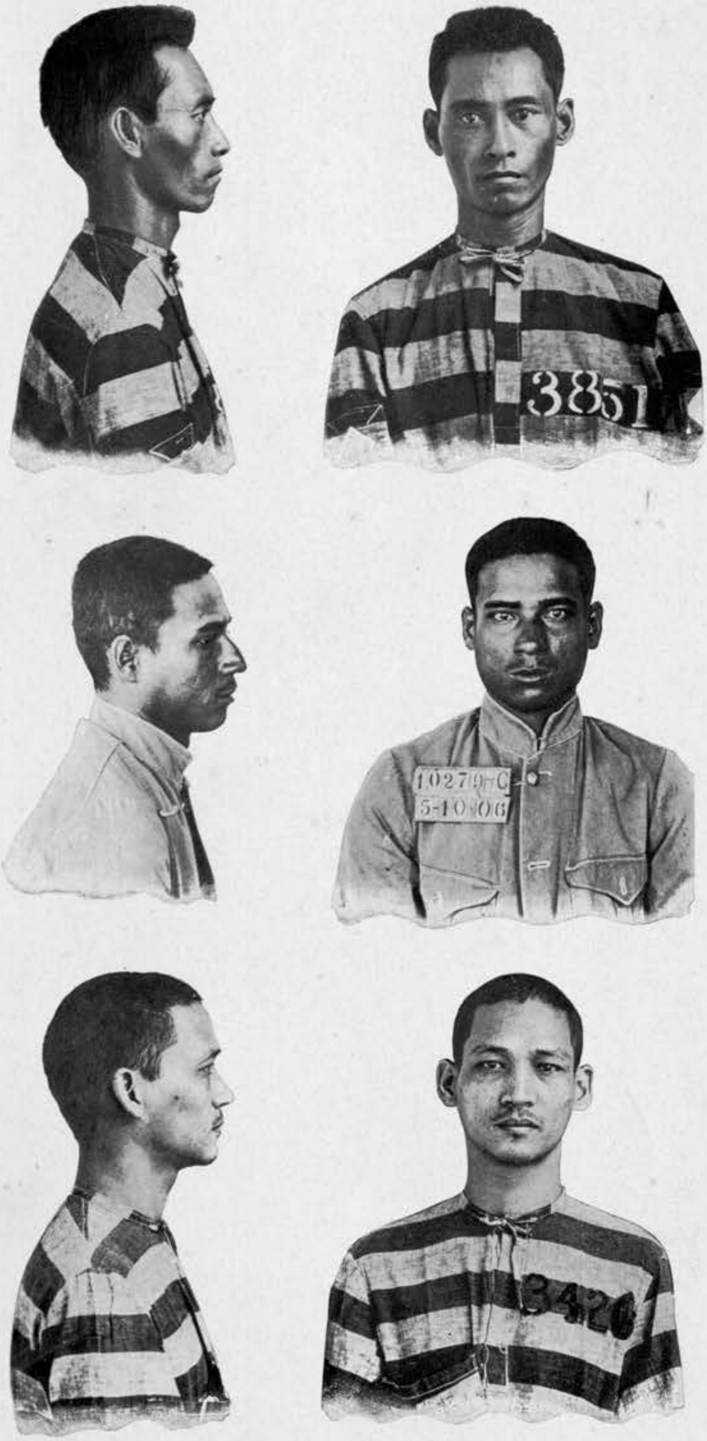


PLATE IX.

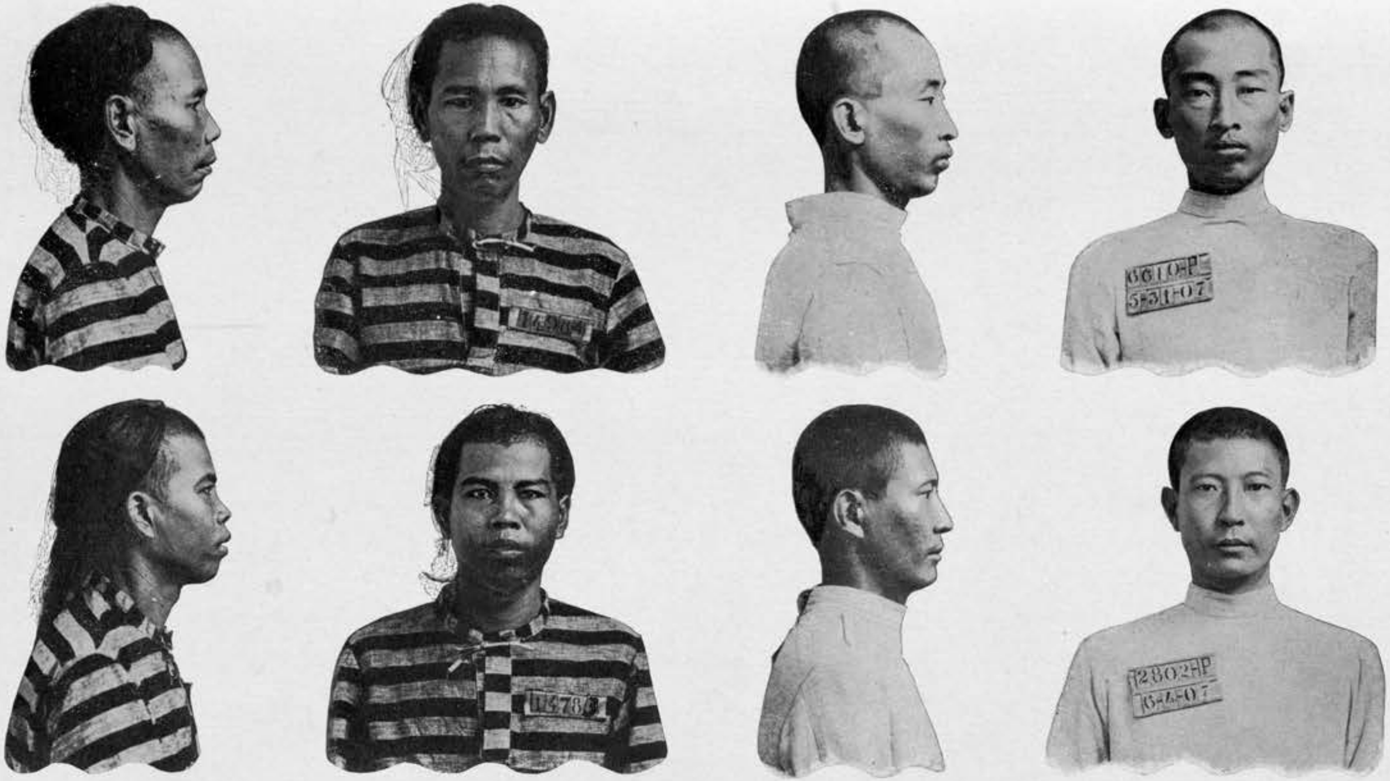


PLATE X.

TWO NEW SPECIES OF SNAKES FOUND IN THE PHILIPPINE ISLANDS.

By Lawrence E. Griffin.

(From the Department of Biology, Philippine Medical School.)

In the collection of reptiles in the museum of the Biological Laboratory, Bureau of Science, are two species of snakes belonging to the genus *Dendrelaphis*, which appear to be new. Their descriptions follow.

Dendrelaphis caeruleatus sp. nov.

Maxillary teeth 18 or 19. Eye as long as its distance from the nostril (a little longer in young specimen). Rostral broader than deep, barely visible from above; internasals three-fourths as long as the prae-frontals; frontal once and a third as long as broad, as long as its distance from the end of the snout (longer in young specimen), shorter than the parietals; loreal twice as long as broad; one prae- and two post- oculars; temporals 2+3; nine upper labials, fifth and sixth entering the eye; five lower labials in contact with the anterior chin shields, which are considerably shorter than the posterior. Scales in 13 rows. Anal divided.

Dark brown or nearly black above; a very indistinct black stripe on each side of the head, passing through the eye; lower surface of the head cream-yellow; upper lip splotched with blue and cream-yellow, outer rows of scales and ventrals blue, slightly tinged with green; a narrow black line along the outer edge of the subcaudals and posterior ventrals; a black median line along the lower surface of the tail. When the scales of the upper surface are rubbed off the underlying skin is of a dull blue color.

Museum.	Number.	Locality.	When collected.	Collector.	Total length.	Length of tail.	Scale rows.	Ventrals.	Anals.	Subcaudals.	Temporals.	Supra-labials.
					Mm.	*Mm.*						
Bureau of Science	a	Siquijor	Mar., 1908	A. Celestino	840	225	13	173	2	104	2+2	9
Bureau of Science	b	Banton	Aug. 2, 1905	A. Celestino	1,055	287	13	186	2	105	2+2	9

Dendrelaphis fuliginosus sp. nov.

Maxillary teeth 18. Eye as long as its distance from the nostril. Rostral broader than deep, barely visible from above; internasals a little shorter than the prae-frontals; frontal once and a half as long as broad, longer than its distance from the end of the snout, a little shorter than the parietals; loreal elongate; one prae- and two post-oculars; temporals 2+2; nine upper labials, fifth and sixth entering the eye; five lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 13 rows. Anal divided.

Uniform seal-brown above, shading into a slightly lighter shade beneath, upper lip and lower surface of head and throat fuscous. Scarcely visible traces of a black median line along the lower surface of the tail; a faint dark stripe on each side of the head and neck, passing through the eye; a lighter spot on each supra-ocular and near the posterior edge of each parietal.

Museum.	Number.	Locality.	When collected.	Collector.	Total length.	Length of tail.	Scale rows.	Ventrals.	Anals.	Subcaudals.	Temporals.	Supra-labials.
					Mm.	*Mm.*						
Bureau of Science	a	Negros	1902	C. S. Banks	350	90	13	179	2	105	2+2	9

THE FISHERY RESOURCES OF THE PHILIPPINE ISLANDS:
II. SPONGES AND SPONGE FISHERIES.

By Alvin Seale.

(From the Section of Fisheries, Biological Laboratory, Bureau of Science.)

INTRODUCTION.

The past year has marked the opening of the Philippine sponge fisheries from a commercial standpoint, some thirty thousand sponges having been shipped from the Islands during the year. The greater part of these were sold in Singapore for export to London. Philippine sponges are new products to the trade and many of them are slightly different from those usually handled and therefore the prices obtained varied greatly, in some instances, no doubt, being below the real value of the export.

Specimens of all the different varieties of Philippine sponges at present obtainable were taken to the United States and shown to Dr. H. F. Moore, of the United States Bureau of Fisheries. They were compared with specimens from Florida, Cuba, and the Mediterranean. After this the same specimens were taken to some of the largest wholesale sponge dealers in New York and San Francisco, who examined them with great interest, suggested commercial names for those new to the trade, and so far as possible, gave quotations of prices of sponges of the latter class among the samples. The facts I have so far collected are given below.

SPONGES IN GENERAL.

A sponge when in its native state (see Pl. I) closely resembles a boiled plum pudding covered by a thin, dark skin. It is quite different in appearance from the ordinary sponge of commerce which is merely the bleached skeleton of the animal.

Sponges are usually classed by themselves in the faunal subkingdom *Porifera;* most of the sponges belong to the division *Keratosa;* the great majority of the Philippine forms to the genus *Euspongia.*[1]

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[1] It is intended in a later paper to give a small check list with the scientific names of all the Philippine sponges.

All of the several varieties of soft sponges found in the Philippines are of more or less commercial value. In addition to these, an almost unlimited variety of silicious sponges is encountered; the fiber of these is now being used in some countries as a substitute for asbestos.

PHILIPPINE SPONGES OF COMMERCIAL VALUE.

THE SHEEP'S-WOOL SPONGE (PLATE II).

The sheep's-wool sponge is the most valuable variety found in the Philippines. It has a strong, elastic fiber, resembling in every respect the well-known sheep's-wool or bath sponge of Florida and it probably grows to about the same size. The only place where this sponge at present is known to occur in the Philippines is at Siasi, but doubtless it will also be found around Tawi-Tawi. It would be to the advantage of those interested in sponging to give particular attention to the finding and developing of these sponges, as they are well-known to the trade, are always in demand, and the supply is becoming limited. There would be no difficulty in marketing any quantity in the United States or Europe where the product would bring from 8 to 20 pesos (4 to 10 dollars, United States currency) per kilo in wholesale lots. The specimen figured is of second grade and the price quoted by the largest New York dealer was ten pesos per kilo.

THE PHILIPPINE ZOMOCCA SPONGE (PLATE III).

This is a very tough, elastic sponge of moderately coarse fiber, usually rather flat in shape. The organisms grow in shallow water of 1.2 to 2 meters' depth, on a hard rock bottom. Specimens 30 centimeters in diameter are frequently found. This sponge seems to be intermediate in grade between the sheep's-wool and grass sponges; some of the dealers classing it with the former and others with the latter. All admit it to be different from any of the American forms. Dr. Moore considered it to be the best among those submitted to him and suggested the name "flat bath sponge" for it. However, a comparison with a large number of European sponges on the market induced me to follow the suggestion of one of the sponge dealers and term it the Philippine Zomocca sponge because it most nearly resembles the well-known commercial form, the European "Zomocca."

This sponge is found in considerable numbers in the waters around Tawi-Tawi and the nearby islands; in deeper water, it will be of better quality. In all probability it occurs near other islands of the Archipelago.

The Philippine Zomocca sponge would find a ready market both in the United States and in Europe, the wholesale price quoted being from two to six pesos per kilo.

THE PHILIPPINE ROCK SPONGE (PLATE IV).

No commercial name exists for this organism. It resembles the Florida yellow sponge to a certain extent, but the fiber is not as strong and the texture is considerably softer. It is very porous and covered with small tufts. It grows attached to bowlders and rocks in water of 1.5 to 5 meters in depth, reaching a diameter of 40 centimeters. Some of the dealers whom I consulted designated this as a good sponge; others considered it to be almost worthless. As a matter of fact it is not very durable and therefore would probably not bring a large price. It is only known from the Island of Sitanki, but it probably will be found throughout the Sulu group.

THE PHILIPPINE REEF SPONGE (PLATE V).

This is a beautiful sponge of very soft, closely woven fiber; unfortunately it is quite fragile. This fact greatly detracts from its value; however, it is of a slightly better quality than the majority of American reef sponges. This specimen was termed "glove sponge" by some of the wholesale dealers of New York, but reef sponge is undoubtedly a better name. It is quite abundant in many places in the southern Philippine Islands, especially so at Sitanki, where it is found in very shallow water, usually growing on the reefs among the moss and seaweed. It reaches a diameter of 20 to 25 centimeters. It is a fine, soft, bath sponge, but because of its fragile nature its period of usefulness is short. Considering its abundance, cheapness, and the ease with which it is gathered, the probabilities are that it will play an important part in the Philippine sponge industry.

The prices quoted on this sponge ranged from 2 to 3 pesos per kilo.

PHILIPPINE GRASS SPONGES (PLATE VI).

The group of grass sponges which embraces a variety of forms representing distinct genera, contains the great majority of sponges found in almost all Philippine waters; they are especially abundant at Sitanki, Tawi-Tawi and Siasi to the south, and at Masbate and Cebu farther to the north. In these places they outnumber all the other sponges combined. They are usually encountered on reefs, in water of from 40 centimeters to 1.5 meters in depth. They are from 8 to 30 centimeters in diameter.

The best grade of Philippine grass sponge (shown by Pl. VI) is of a closely woven, fine, and soft texture; it is in every respect most desirable for bathing or general use. More than thirty thousand of these sponges were taken from the beds at Sitanki during the past year, but many were of very small size and also poorly cleaned, so that the price obtained was very low. Wholesale dealers gave the value of my specimen and 1.5 meters deep. Its advantages are that it keeps the sponges clean and it may be towed to any place; its own weight sinks it sufficiently to keep the sponges under water.

The cleaning is greatly facilitated by frequently squeezing out the sponges and a flat paddle of considerable weight may be used with good effect. (Fig. 2.) A washboard made by tacking a cleat 2 centimeters thick about 8 centimeters from each end of a wide board and then stretching galvanized wire netting of 2 centimeters' mesh over the cleats, tacking it to the ends of the board, is very useful. (Fig. 3.) This instrument is especially useful to remove the dead, black skin from the sponges. After five or six days in water, during which time the sponges have been thoroughly squeezed, they are washed out in clean, salt water and put in the sun to dry. They should still be kept in the same position in which they grow, otherwise they are apt to burn and become red. However, the red color should not be confused with that which many sponges naturally show in the center of their structure. The sponges may be strung on stout twine about two meters in length to facilitate handling them rapidly. Salt water only is used in curing. After the sponges are thoroughly dry they are ready to sack or bale for market. Great care should be taken that the sponges are thoroughly dry and clean, as the Philippine sponge can only obtain the best market if it is always shipped as a thoroughly cured, cleaned article.

BLEACHING SPONGES.

Sponges are always shipped to the general market in an unbleached condition, but the following method by R. F. Bacon, of the chemical laboratory, Bureau of Science, is very effective, doing the least damage to the fiber:

> The sponges are placed in a saturated solution of potassium permanganate for two minutes, then transferred to fresh water and thoroughly washed. They are then squeezed out in a 10 per cent solution of sodium bisulphite until white; then again thoroughly washed in fresh water until all the chemicals are removed. They are afterward dried in the sun.

CULTIVATION AND GROWING OF SPONGES.

The growing of sponges for commerce has become established and it promises to result in a profitable industry.

Sponges are reproduced from eggs and by budding. The eggs are formed and fertilized within the body of the sponge; they develop into minute, free-swimming forms which are thrown out into the water through the large openings. After about twenty-four hours the young settle, become attached, and grow into separate sponges. Reproduction by budding, however, is the method taken advantage of in growing sponges from cuttings. The sponge should be placed on a wet board, or better still, kept under water and cut with a very sharp knife into cubes of about 5 centimeters, care being taken to keep on as much of the thin, black skin as possible and not to squeeze the animal. These pieces are then placed on a thick, copper wire, about 4 centimeters apart, the wire being fastened to stakes at each end and about 15 centimeters above the bottom. (Fig. 4.) It is quite possible that rattan would do as well as copper wire; bamboo has been used with fair results. Within a day or two the sponges become attached to the wire and grow into fine, round organisms which have a much better shape than those growing naturally. These slips planted in Florida waters reached a marketable size in less than two years. The time required for them to grow in the Philippines is not known.

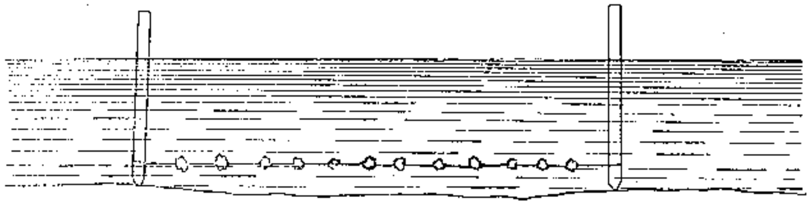

FIG. 4.

Sponges should always be propagated in water in which they grow well naturally and at about their normal depth. It is probable that improved varieties can be cultivated by uniting cuttings of superior sponges, and some of the best grade of European sponges might even be introduced with advantage.

It is my firm conviction that by care and work, not only in growing sponges, but by opening new beds, and fishing in deeper waters, a sponge industry amounting to several hundred thousand pesos per year may be built up in the Philippines.

Regulations governing the gathering of sponges in the waters of the Moro Province were passed in June, 1908, and copies of these regulations may be obtained from the Secretary of the Moro Province at Zamboanga.

LITERATURE.

The following is a very incomplete list of literature dealing with sponges, chiefly of this or related regions:

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Revision of the North American Poriferæ, *Mem. Boston Soc. Nat. Hist.* (1875), **2**.

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A Monograph of the Australian Sponges, *Proc. Linn. Soc.* N. S. W. (1883), **9**, 121, 310; (1884-85), **10**, 283, 475, 481, 485.

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POLÉJAEFF.

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Die Familie Spongidæ, *Zeit. f. wiss. Zoöl.* (1879), **32**.

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The Florida Commercial Sponges, *Bull. U. S. Fish Com.* (1897), **17**, 225 to 240. Pl. 12 to 31.

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On the Feasibility of Raising Sponges from the Egg, *Ibid* (1897), **17**, 241 to 245.

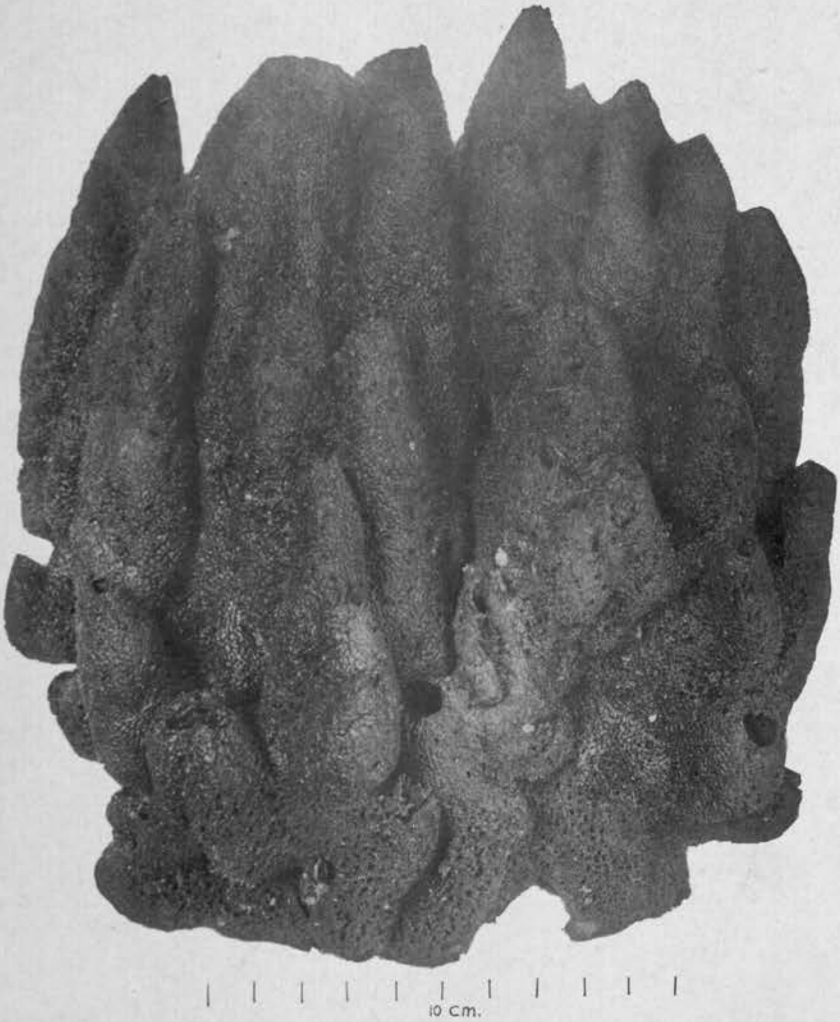
WHOLESALE SPONGE BUYERS.

For the benefit of those interested directly in the sponge industry I am appending a list of some of the sponge buyers in the United States who would be glad to correspond with those who have sponges for sale:

LASKER & BERNSTEIN, 161 William St., New York City.
COFFIN, REDINGTON, Co., 35 Second St., San Francisco.
LANGLY & MICHAELS Co., San Francisco.
AMERICAN SPONGE Co., 127 Larkin St., San Francisco.
A. ISAACS & Co., Beatman St., New York City.
LEONIS CLONNEY & Co., 39-41 Walker St., New York City.
SMITH, KLINE & FRENCH, Philadelphia, Pa.
JAMES H. KOHDS & Co., 117 E. Kinzie St., Chicago, Ill.
MEYER BROS., DRUGGISTS, St. Louis, Mo.
THE GREEK AMERICAN SPONGE Co., Chicago, Ill.
JOHN K. CHEYNEY, Tarpon Springs, Fla.

ILLUSTRATIONS.

PLATE I. A Philippine commercial sponge in its natural state.
II. The Philippine Sheep's-Wool Sponge.
III. The Philippine Zomocca Sponge.
IV. Philippine Rock Sponge.
V. The Philippine Reef Sponge.
VI. The Philippine Grass Sponge.
VII. The Sulu Sea Bath Sponge.
VIII. The Philippine Elephant's-Ear Sponge.
IX. The Tube Sponge.
FIG. 1. (In the text.) The Byersdoffer floating corral.
2. (In the text.) The Byersdoffer paddle.
3. (In the text.) The Byersdoffer sponge washboard.
4. (In the text.) Sponges planted on copper wire.



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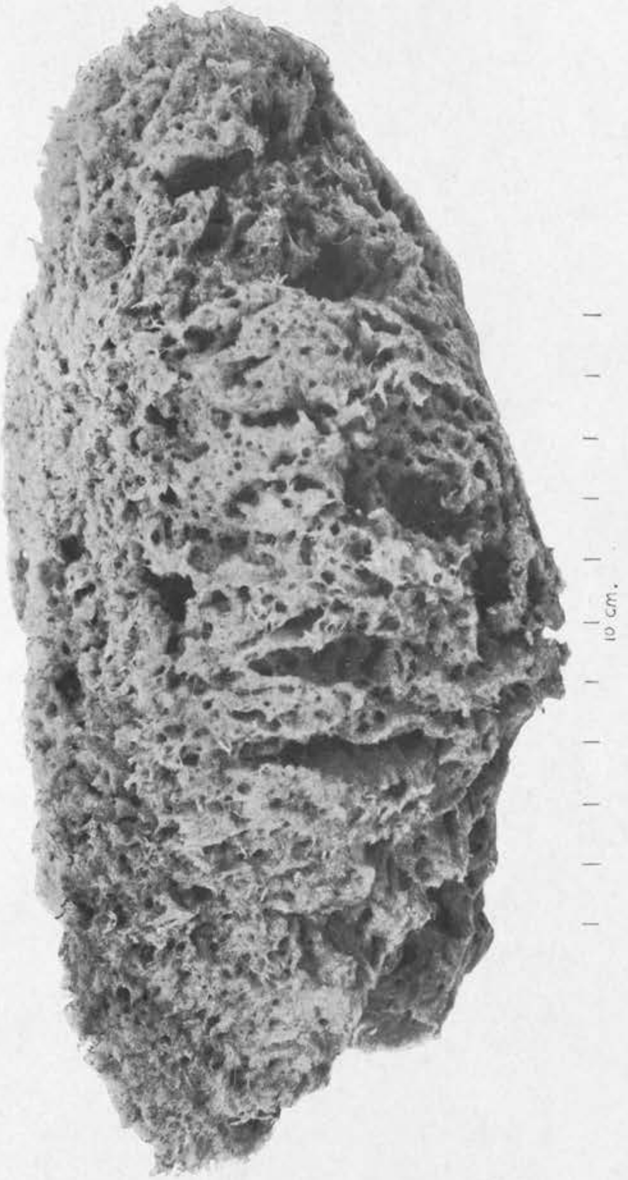

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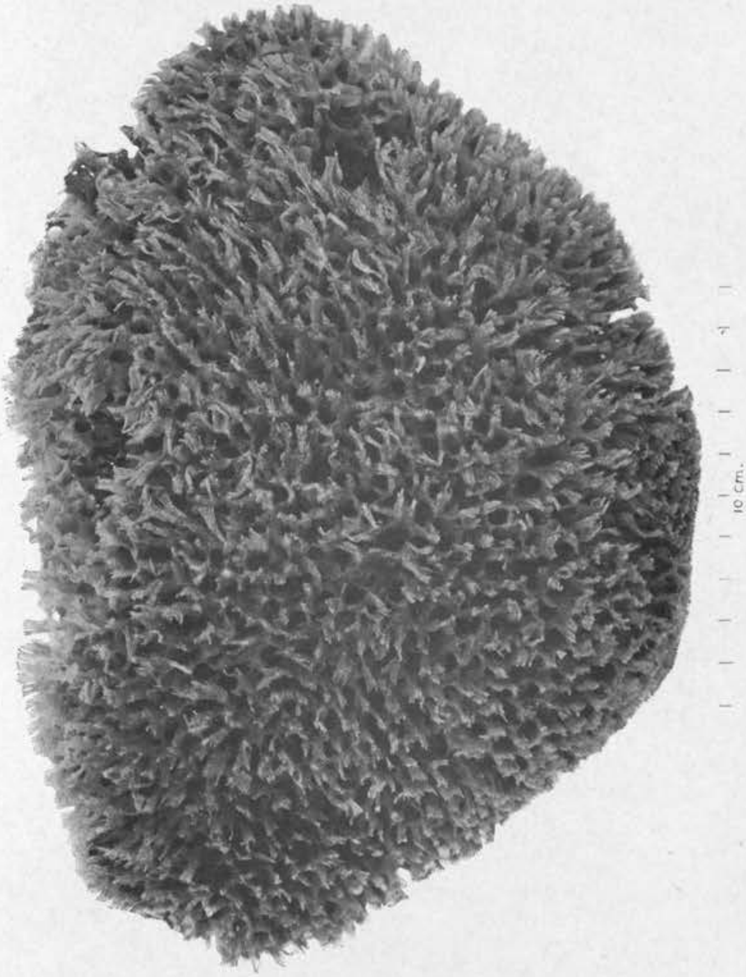

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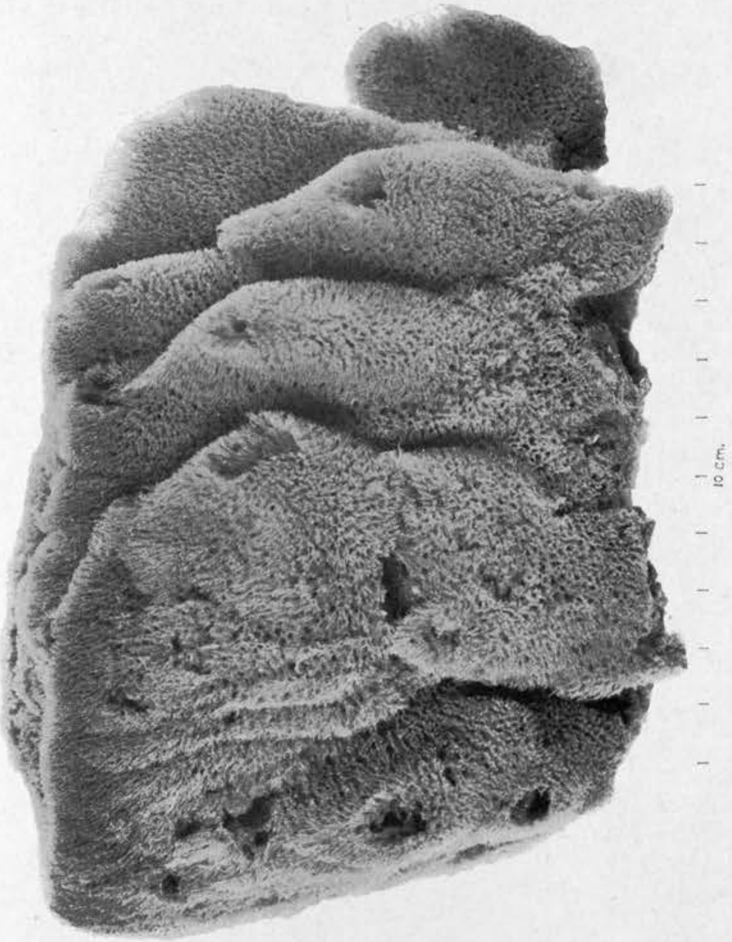

PLATE V.

PLATE VI.

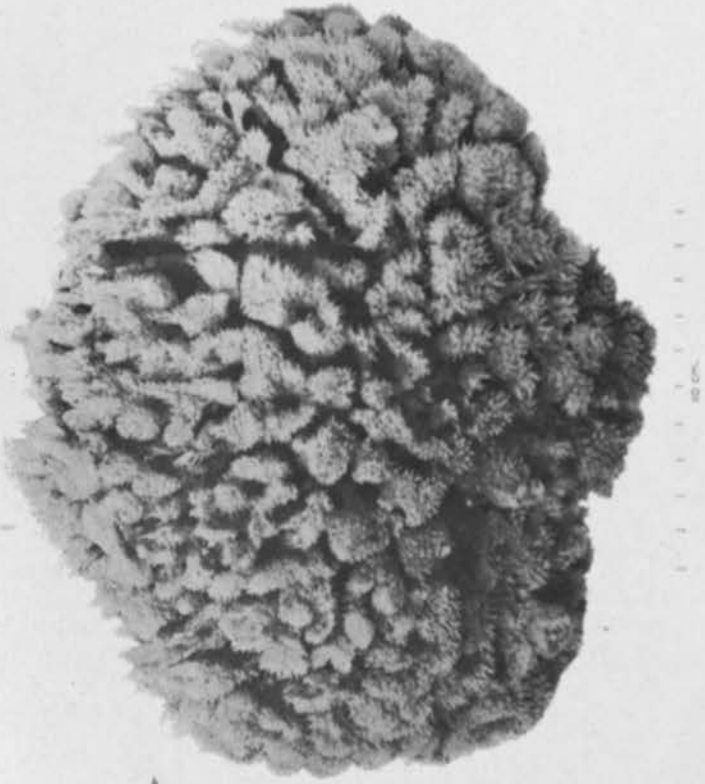

PLATE VII.

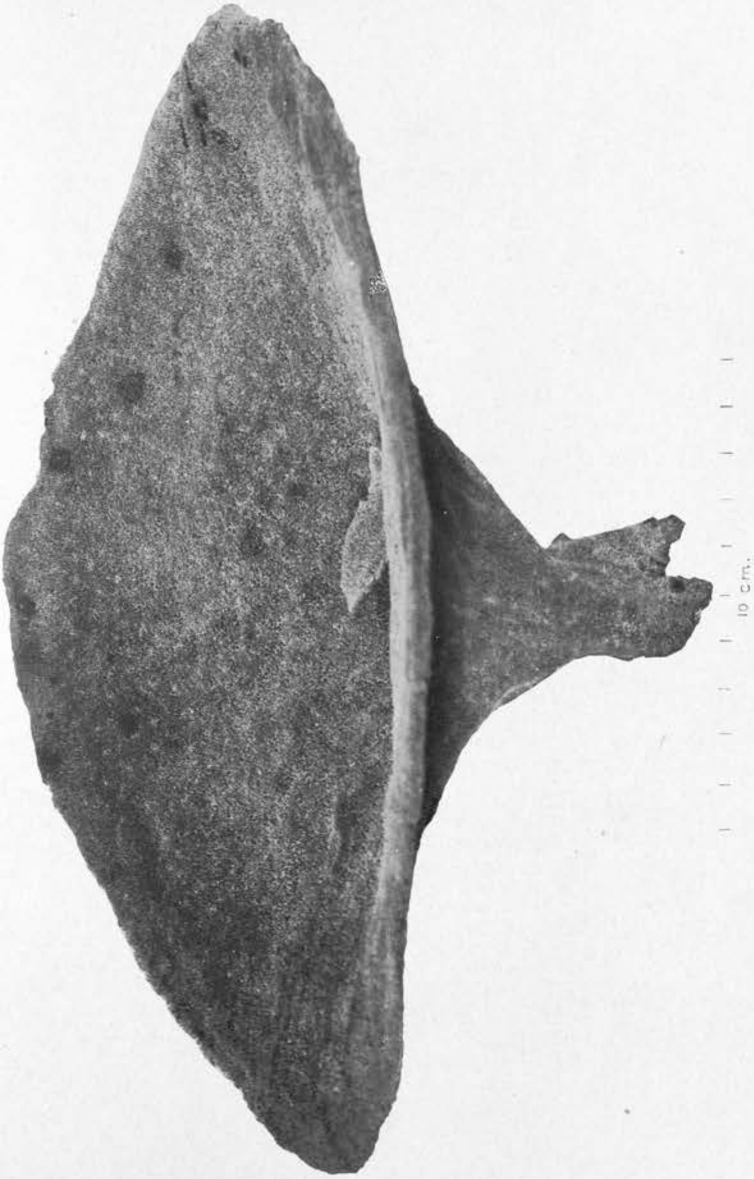

PLATE VIII.

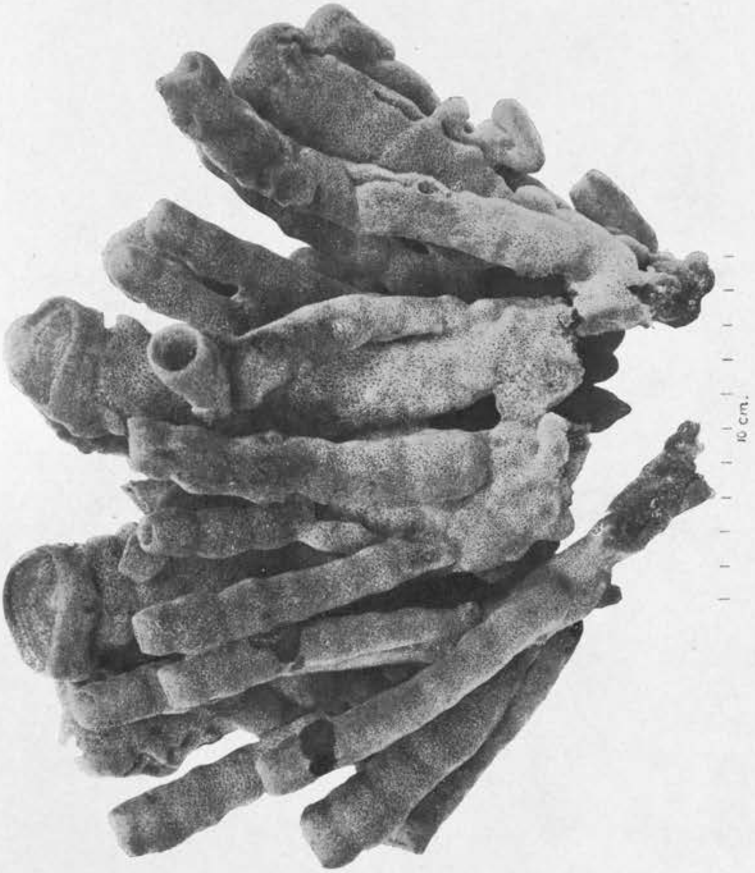

PLATE IX.

A COLLECTION OF BIRDS FROM NORTHERN MINDANAO.

By Richard C. McGregor.

(*From the Zoölogical Section, Biological Laboratory, Bureau of Science, Manila, P. I.*)

During the months of October, November, and December, 1907, Mr. Andres Celestino, an assistant in the Bureau of Science, was engaged in collecting zoölogical specimens in northern Mindanao. He spent a few days at Cagayan and nearly a month in the vicinity of Esperanza on the Agusan River; the remaining time he employed at Butuan. The present paper is a list of the birds collected by Mr. Celestino on this trip. Most of these are species of wide distribution, or are already well known from Mindanao, but the following I believe have not been previously recorded from that island, namely: *Mareca penelope, Tachornis pallidior, Camiguinia helenæ, Eudrepanis pulcherrima, Oriolus samarensis* and *Corvus samarensis.*

The capture of *Chloropsis flavipennis* in northern Mindanao is especially noteworthy. Blasius had recorded this species from near Davao, but the record had been considered somewhat doubtful. The Island of Cebu is the only other locality where the species has been found.

LIST OF SPECIES COLLECTED.

TRERONIDÆ.

Osmotreron axillaris (Bonaparte).

One adult male.

Phapitreron amethystina Bonaparte.

Four males and one female from Butuan. These can not be distinguished from specimens collected in Bohol or in Luzon.

Phapitreron brevirostris Tweeddale.

One male and three females from Butuan. *P. albifrons* of Bohol is closely related to this species, but differs in having the forehead white and the subocular line decidedly brown instead of black.

Muscadivores chalybura (Bonaparte).

One specimen of the fruit pigeon is probably of this species.

Ptilocolpa mindanensis Grant?

The only *Ptilocolpa* in the present collection is a female and, as no other specimen from Mindanao is available, its identity is somewhat doubtful.

PERISTERIDÆ.

Chalcophaps indica (Linnæus).

One female with plumage partly immature.

CHARADRIIDÆ.

Charadrius fulvus (Gmelin).

Three specimens, taken November 2 to 17, are in winter plumage.

Himantopus leucocephalus Gould.

Six specimens from Cagayan, September 12, 1907.

Rhyacophilus glareola (Linnæus).

One female.

Pisobia ruficollis (Pallas).

Six specimens in winter plumage were collected at Butuan, November 9, 1907.

Gallinago megala Swinhoe.

Swinhoe's snipe is represented by a female, taken November 4.

CICONIIDÆ.

Dissöura episcopus (Boddaert).

A female was taken at Cagayan.

ARDEIDÆ.

Butorides javanica (Horsfield).

One male was taken November 5. This specimen appears to belong to the small-billed race and not to *B. amurensis*.

ANATIDÆ.

Mareca penelope (Linnæus).

A pair in nonbreeding plumage, taken December 27, are the third and fourth specimens to be recorded from the Philippines. This is also the first record of the occurrence of the species in Mindanao.

FALCONIDÆ.

Circus melanoleucos (Pennant).

A female in second year plumage was taken on September 13.

Astur trivirgatus (Temminck).

A pair of adults and one young female.

Accipiter manillensis (Meyen).

One male.

Lophotriorchis kieneri Sharpe.

A female of this species, killed October 12, held in its claws a *Tanygnathus everetti*. Both birds were preserved.

Spilornis holospilus (Vigors).

One male specimen.

Pernis ptilorhyncus (Temminck).

A male in perfect plumage was taken, October 21.

Microhierax meridionalis Grant.

A pair taken in Butuan, September 18. The male does not have the characters given by Grant, as the inner webs of the primaries are conspicuously barred with white. This barring is probably a character of the young and I doubt the validity of the species *M. meridionalis.*

PANDIONIDÆ.

Polioaëtus ichthyætus (Horsfield).

One specimen of this powerful fishing eagle was collected near Butuan, Mindanao. A young female was taken near Naujan, Mindoro.

BUBONIDÆ.

Ninox japonica (Temminck and Schlegel).

One female from Butuan, November 29.

Ninox spilocephala Tweeddale.

One female from Butuan.

CACATUIDÆ.

Cacatua hæmaturopygia (P. L. S. Müller).

One male and one female; the latter has the breast, abdomen, and flanks faintly washed with red.

PSITTACIDÆ.

Prioniturus discurus (Vieillot).

One male of this common species.

Tanygnathus lucionensis (Linnæus).

One adult male and two young females.

Tanygnathus everetti Tweeddale.

This distinct species is represented by three males and one female. One of the males had been killed by a Kiener's hawk. As pointed out by Grant, the female of Everett's parrot has the bill dirty white, while in the male the bill is red as in both sexes of the common species, *T. lucionensis.*

Bolbopsittacus mindanensis (Steere).

Seventeen specimens representing both sexes.

Loriculus apicalis Souancé.

Five specimens. The only male is immature so that it is useless to compare these birds with other species.

PODARGIDÆ.

Batrachostomus septimus Tweeddale.

A female taken near Butuan, October 5, differs from a female taken in Basilan, in being slightly darker and a little more rusty on the back, throat, and breast. The tail is decidedly longer; 123 mm. in the Mindanao specimen against 110 in the Basilan female.

CORACIIDÆ.

Eurystomus orientalis (Linnæus).

One specimen of this common roller.

ALCEDINIDÆ.

Pelargopsis gigantea Walden.

One male in good plumage.

Alcedo bengalensis Brisson.

A pair from Butuan.

Alcyone argentata (Tweeddale).

Sixteen specimens. Two of these are slightly bluer than the others, but do not agree with *A. flumenicola* from Samar. This species closely resembles *A. flumenicola,* but differs from that species in having the chin and throat pure white and the under parts washed with greenish-blue; the bill is slightly longer in *A. argentata.*

Ceyx mindanensis Steere.

One male and two females. These do not differ from specimens taken in Basilan. The amount of black on the back probably depends upon the age of the individual.

Halcyon coromandus (Latham).

One adult male was taken November 2; another male, taken November 22, has the feathers of throat, breast, and sides of neck edged with dark brown, forming numerous crescent-shaped marks.

Halcyon gularis (Kuhl).

One female.

Halcyon winchelli Sharpe.

One male and one female.

Halcyon chloris (Boddaert).

One female.

Halcyon hombroni (Bonaparte).

One male of this rare kingfisher was taken during October.

BUCEROTIDÆ.

Hydrocorax mindanensis (Tweeddale).

One immature female.

Penelopides affinis Tweeddale.

One young female with smooth bill was taken September 18.

Craniorrhinus leucocephalus (Vieillot).

One male and two females in adult plumage.

MEROPIDÆ.

Merops americanus P. L. S. Müller.

One female.

CAPRIMULGIDÆ.

Lyncornis macrotis (Vigors).

One female from Butuan, October 21. This specimen is exactly similar in color to a female from Bataan Province, Luzon, but is much smaller. The male collected by us in Basilan is also smaller than males from Luzon and from Mindoro. Whitehead found both large and small birds in northern Luzon. Grant,[1] who had the advantage of comparing his specimens with the types, seemed to think that *mindanensis* was not distinct from *macrotis*. Whitehead was in doubt on the subject and gave both species in his field notes.[2] The case is a very puzzling one. Were it not for Whitehead's single small specimen from Luzon I should certainly consider these two species distinct.

Measurements of Lyncornis.

Sex and locality.	Wing.	Tail.
	mm.	*mm.*
Male from Basilan	265	165
Male from Mindoro	282	180
Female from Mindanao	252	160
Female from Luzon	280	190

CYPSELIDÆ.

Collocalia troglodytes Gray.

One female was taken, September 23.

Collocalia fusciphaga (Thunberg).

A single specimen of Thunberg's swift was collected.

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[1] *Ibis* (1894), VI, 6, 519; (1895), VII, 1, 463.

[2] *Ibis* (1899), VII, 5, 383.

Tachornis pallidior McGregor.

Three specimens from Butuan, November 9. These differ slightly from typical specimens in having the back darker and of a less smoky hue, but the difference does not seem to be sufficient for specific separation. This genus has not previously been recorded from Mindanao.

TROGONIDÆ.

Pyrotrogon ardens (Temminck).

One pair.

CUCULIDÆ.

Surniculus velutinus Sharpe.

Two males were taken in October.

Chalcococcyx malayanus (Raffles).

A female taken at Butuan, September 25, is in every respect similar to a female taken in Basilan.

Eudynamys mindanensis (Linnæus).

An immature female in mixed plumage was taken October 4. This specimen is similar to a female from Fuga Island in which the black plumage is partly replaced by the barred and spotted plumage of the adult.

Centropus melanops Lesson.

One female of this striking cuckoo.

CAPITONIDÆ.

Xantholæma hæmacephalum (P. L. S. Müller).

One adult male.

PICIDÆ.

Yungipicus fulvifasciatus Hargitt.

One male.

Chrysocolaptes montanus Grant.

A pair from Butuan. I have compared these two with specimens of *C. lucidus* from Basilan and with *C. rufopunctatus* from Bohol, and believe that they are specimens of Grant's *C. montanus*. The male has the shaft of one tail-feather dirty white.

Lichtensteinipicus fuliginosus (Tweeddale).

One pair of adult birds and one young female. The latter resembles the adult female, but lacks the white tips on feathers of throat and head which are indicated by faint, gray spots.

EURYLÆMIDÆ.

Sarcophanops steeri Sharpe.

Two males and one female from Butuan.

PITTIDÆ.

Pitta erythrogaster Temminck.

One adult male from Cagayan and one immature female from Butuan.

MUSCICAPIDÆ.

Muscicapula basilanica (Sharpe).

One male in poor plumage, September 21.

Hypothymis occipitalis (Vigors).

One male specimen of this common blue flycatcher.

Rhipidura superciliaris (Sharpe).

One male. This species seems to belong in the genus *Rhipidura* rather than in *Hypothymis.*

Camiguinia helenæ (Steere).

The little blue flycatcher, which was described from Camiguin Island as *Camiguinia personata,* proves to be the same as *Cyanomyias helenæ* Steere. Nevertheless I believe that the genus *Camiguinia* is a valid one. A number of specimens were collected in northern Mindanao which is a new locality for this species.

Cyanomyias cœlestis (Tweeddale).

One male and one female.

Zeocephus cinnamomeus Sharpe.

Two males without elongated central tail-feathers.

Rhinomyias ruficauda (Sharpe).

Six specimens from Mindanao differ in no way from others collected by us in Bohol and Basilan.

Cryptolopha olivacea (Moseley).

Two specimens from Butuan.

CAMPOPHAGIDÆ.

Artamides kochi Kutter.

One pair of this well-marked species was taken at Butuan on November 20.

Lalage minor (Steere).

Three males and two females from Butuan. This species, while similar to *L. melanoleuca,* is considerably smaller and the female has the throat and breast nearly uniform gray, not barred as in *L. melanoleuca.* A young male resembles the female, but has the throat and breast barred with white.

Lalage niger (Forster).

One specimen.

PYCNONOTIDÆ.

Chloropsis flavipennis (Tweeddale).

One female from Butuan, October 14, in worn plumage. Wing, 87 mm.; tail, 72; exposed culmen, 21. This is the most interesting specimen in the present collection as it confirms the record made by Blasius which for a long time was considered a mistake. Fortunately we are enabled to compare this interesting specimen directly with skins of *C. flavipennis* from Cebu. The Butuan skin is a little darker green than the Cebu skins, but with the material at hand there are no grounds for separating the Mindanao bird.

Iole philippensis (Gmelin).

One male and one female.

Iole everetti (Tweeddale).

One male in fine plumage from Butuan.

Poliolophus urostictus (Salvadori).

One specimen, October 5.

Pycnonotus goiavier (Scopoli).

One specimen.

TIMELIIDÆ.

Ptilocichla mindanensis Steere.

One male and two females. This species differs very slightly from *P. basilanica*. In the latter species the back is more olivaceous-brown, but there is no appreciable difference in the size of the two species.

Zosterornis capitalis (Tweeddale).

Seventeen specimens, including adults and young of both sexes. The young birds, taken in September, differ from the adults in having chin, throat, and rest of under parts white, faintly gray on sides of breast; forehead and fore part of crown ocherous, the shafts lighter and conspicuous. Specimens from Basilan are slightly larger than those from Mindanao but the difference is trifling.

Macronous mindanensis Steere.

Several specimens collected.

SYLVIIDÆ.

Orthotomus frontalis Sharpe.

One male from Cagayan and a pair from Butuan.

Orthotomus nigriceps Tweeddale.

Two adult males and two young females from Butuan. One of the young birds has the chin and throat spotted with white. The other young bird has chin and throat almost all white. As pointed out by

Sharpe,[1] the type figured by Tweeddale[2] is a young bird. The adult has chin, throat, and sides of head and neck black, the white being confined to lores, a ring around eye, and a line over eye which extends backward to occiput. There is also a trace of white on chin and jaw.

Megalurus tweeddalei McGregor.

One specimen of the rufous-headed grass warbler.

Acanthopneuste borealis (Blasius.)

One specimen, taken in October.

Acanthopneuste xanthodryas (Swinhoe).

A willow warbler, taken at Butuan in November, is identified as *A. xanthodryas,* because of its yellowish coloration and comparatively long first primary.

ARTAMIDÆ.

Artamus leucorynchus (Linnæus).

A pair taken in November; the female has two white feathers on the forehead.

LANIIDÆ.

Otomela lucionensis (Linnæus).

One male was taken, November 6.

Hyloterpe apoensis Mearns.

A pair from Butuan.

CERTHIIDÆ.

Rhabdornis minor Grant.

Four males and two females of this well-marked species. Males from Mindanao have the bill a trifle longer than males from Bohol, but there are no color differences correlated with this.

DICÆIDÆ.

Dicæum papuense (Gmelin).

Three specimens.

Dicæum davao Mearns.

One male taken, November 4; wing, 43 mm.; tail, 21; culmen from base, 10; tarsus, 11.

Dicæum cinereigulare Tweeddale.

Three males and three females from Butuan. The orange-breasted flowerpecker of Bohol seems to belong to this species and not to *D. besti.*

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[1] Cat. Birds Brit. Mus. (1883), 7, 222.

[2] *Proc. Zoöl. Soc.* London (1877), 828, pl. 85.

Dicæum mindanense Tweeddale?

One female of a plain-colored *Dicæum* is doubtfully assigned to this species.

NECTARINIIDÆ.

Æthopyga bella Tweeddale.

Two young males in molt, three females in good plumage, and one immature female. Neither of the males shows all the specific characters, but I do not hesitate to identify them as *Æ. bella,* the type of which came from Surigao.

Eudrepanis pulcherrima (Sharpe).

Two adult males of this handsome little sunbird were taken in October. *E. decorosa* of Bohol differs from this species in being very much lighter yellow on chin, throat, and breast. *Eudrepanis pulcherrima* has not been previously recorded from Mindanao.

Cinnyris sperata (Linnæus).

One male.

Cinnyris jugularis (Linnæus).

One adult male and one immature male, the latter taken in September.

Arachnothera flammifera Tweeddale.

Three males and one female.

Anthreptes griseigularis Tweeddale.

Two males in freshly molted plumage were taken, December 26.

MOTACILLIDÆ.

Anthus rufulus Vieillot.

One female.

Anthus gustavi Swinhoe.

Two specimens. The only previous record for Mindanao is that by Grant.[1]

PLOCEIDÆ.

Munia jagori Martens.

A male from Butuan, November 17, has the head and neck extremely black.

Uroloncha everetti (Tweeddale).

One male was taken, December 27.

ORIOLIDÆ.

Oriolus samarensis Steere.

Two males and two females. These specimens are perfectly similar to a specimen of *O. samarensis* from Catbalogan, Samar.

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[1] *Ibis* (1906), VIII, 6, 472.

DICRURIDÆ.

Dicrurus striatus Tweeddale.

One male and two females.

STURNIDÆ.

Sarcops melanonotus Grant.

The only specimen of bald starling in the collection from Butuan is undoubtedly of the black-backed race.

CORVIDÆ.

Corvus samarensis Steere.

A female crow from Butuan, October 18, is identified as *C. samarensis* without Samar specimens for examination. The measurements of this Butuan skin are nearly the same as those given by Steere for *C. samarensis.* The species has not been taken before in Mindanao, so far as known.

PHILIPPINE ORNITHOLOGICAL LITERATURE, II.

By Richard C. McGregor.

(From the Zoölogical Section, Biological Laboratory, Bureau of Science, Manila, P. I.)

This section of Philippine ornithological literature consists mainly of titles of papers by the Marquis of Tweeddale. Most of these were first published in The Ibis, in the Proceedings of the Zoölogical Society of London, or in the Annals and Magazine of Natural History and were reprinted in the Ornithological Works of Arthur, Ninth Marquis of Tweeddale, the full title of which is given below, under Ramsay. Tweeddale was particularly interested in the birds of the Malayan islands and his last papers constitute a very important part of Philippine ornithological literature.

Hay, Lord Arthur: Descriptions of some supposed new, or imperfectly described, species of birds. *Madr. Jour. Lit. & Sci.* (1845), **13**, 145–164. Reprinted in Tweeddale's Ornith. Works (1881), 1–15.

Description of *Muscicapa bella*, new species, on page 158.

Walden, Viscount: On the rufous-tailed shrikes. *Ibis* (1867), II, **3**, 211–226, pls. 5 & 6. Reprinted in Tweeddale's Ornith. Works (1881), 38–48.

Synonymy and critical notes on *Lanius cristatus*, *L. lucionensis*, and *L. superciliosus*.

Walden, Viscount: Note on Lanius melanthes, Swinhoe, and on Lanius cephalomelas, Bp. *Ibis* (1868), II, **4**, 69–71. Reprinted in Tweeddale's Ornith. Works (1881), 50–51.

Lanius cephalomelas Bonaparte is identified as *L. nasutus* Scopoli.

Walden, Arthur, Viscount: On the Cuculidæ described by Linnæus and Gmelin, with a sketch of the genus Eudynamis. *Ibis* (1869), II, **5**, 324–346, pl. 10. Reprinted in Tweeddale's Ornith. Works (1881), 57–70.

List of the cuckoos described by Linnæus and Gmelin in the 12th and 13th editions of the Systema Naturæ and a review of the genus *Eudynamys*.

Walden, Arthur, Viscount: On the sun-birds of the Indian and Australian Regions. *Ibis* (1870), II, **6**, 18–51, pl. 1. Reprinted in Tweeddale's Ornith. Works (1881), 71–93.

Synonymy and critical notes; the Philippine species considered are: *Arachnechthra jugularis*, *Nectarophila sperata*, *Chalcostetha insignis*, and *Anthreptes malaccensis*.

Walden, Arthur, Viscount: On two new species of birds from the Philippine Islands. *Ann. & Mag. Nat. Hist.* (1872), IV, **10**, 252. Reprinted in Tweeddale's Ornith. Works (1881), 234.

Hyloterpe philippinensis and *Orthotomus castaneiceps*, new species, described.

Walden, Arthur, Viscount: On a collection of birds recently made by Mr. A. H. Everett in northern Borneo. *Ibis* (1872), III, **2**, 360–383, pl. 12. Reprinted in Tweeddale's Ornith. Works (1881), 217–233.

Notes on *Spilornis bacha, Centrococcyx javanensis, Surniculus lugubris, Tchitrea affinis, Melanopitta muelleri, Oriolus xanthonotus,* and several commoner species which range to the Philippines.

Walden, Arthur, Viscount: A list of the birds known to inhabit the island of Celebes. *Trans. Zoöl. Soc.* London (1872), **8**, pt. 2, 23–118, pls. 3–10. Reprinted in Tweeddale's Ornith. Works (1881), 127–215.

Discussion of the zoölogical relationships of Celebes and notes on a number of species which range to the Philippines. *Ægialitis peronii* is figured on plate 10.

Walden, Arthur, Viscount, and **Layard, E. L.**: On birds recently observed or obtained in the Island of Negros, Philippines. *Ibis* (1872), III, **2**, 93–107, pls. 4–6. Reprinted in Tweeddale's Ornith. Works (1881), 114–123.

Notes on 22 species observed or collected by Layard; *Ianthœnas griseogularis, Chrysocolaptes xanthocephalus,* and *Dicrurus mirabilis,* new species, are figured and described.

Walden, Arthur, Viscount: Descriptions of two new species of birds. *Ann. & Mag. Nat. Hist.* (1874), IV, **13**, 123. Reprinted in Tweeddale's Ornith. Works (1881), 253.

Pelargopsis gigantea, new species, described from Salok Island.

Walden, Arthur, Viscount: A list of the birds known to inhabit the Philippine Archipelago. *Trans. Zoöl. Soc.* London (1875), **9**, pt. 2, 125–252, pls. 23–34. Reprinted in Tweeddale's Ornith. Works (1881), 293–413.

A most important review of Philippine ornithology giving a list of 218 species with critical notes and a map of the Philippine Archipelago; the following species are figured: *Limnaëtus philippensis, Ninox philippensis, Pseudoptynx philippensis, Lempijius megalotis, Merops bicolor, M. sumatranus, Cranorrhinus leucocephalus, Penelopides panini, Lanius lucionensis, Pseudolalage melanoleuca, Graucalus striatus, Volvocivora cærulescens, Dicrurus balicassius, Hyloterpe philippensis, Philentoma cyaniceps, Pycnonotus urostictus, Copsychus mindanensis, Amaurornis olivacea, Leucotreron gironieri, Phapitreron amethystina.*

Walden, Arthur, Viscount: [illegible] showing that only one species of *Artamus* is known to i[illegible] the Philippine Archipelago.] *Ibis* (1876), III, **6**, 133–136. [illegible]inted in Tweeddale's Ornith. Works (1881), 420–422.

A discussion on the various names which have been given to the Philippine swallow shrike.

Tweeddale, Marquis of: [Letter on *Anthus gustavi.*] *Ibis* (1877), IV, **1**, 258. Reprinted in Tweeddale's Ornith. Works (1881), 437.

Notes the occurrence of *Anthus gustavi* in Celebes and that it is to be looked for in the Philippines in winter.

Tweeddale, Marquis of: Descriptions of some new species of birds. *Ann. & Mag. Nat. Hist.* (1877), IV, **20**, 533–538. Reprinted in Tweeddale's Ornith. Works (1881), 561–565.

Includes first descriptions of the following Philippine birds: *Tanygnathus everetti, Ceyx argentata, Mulleripicus fuliginosus, Penelopides affinis, Mixornis (?) capitalis, Criniger everetti, Hypothymis cœlestis, Prionochilus olivaceous, Dicæum schistaceum, D. everetti, Æthopyga bella, Ptilopus incognitus.*

Tweeddale, Marquis of: Notes on the species of the genus Batrachostomus inhabiting the Indian Region. *Proc. Zoöl. Soc.* London (1877), 420–445, pls. 45–49. Reprinted in Tweeddale's Ornith. Works (1881), 438–459.

Detailed descriptions and plate (45) of *Batrachostomus affinis.*

Tweeddale, Marquis of: Reports on the collections of birds made during the voyage of H. M. S. 'Challenger' No. II. On the birds of the Philippine Islands. *Proc. Zoöl. Soc.* London (1877), 535–551. Reprinted in Report of the scientific results of the voyage of H. M. S. 'Challenger' during the years 1873–76. (1881), Zoöl. **2**, 5–25, pls. 1–6. Reprinted in Tweeddale's Ornith. Works (1881), 459–475.

Notes on 49 species; *Totanus incanus, Gallinago stenura, Demiegretta sacra,* and *Sterna bergii* are recorded for the first time from the Philippines and the following new species are described: *Loriculus panayensis, Batrachostomus septimus, Dicrurus striatus, Nectarophila juliæ. Buceros mindanensis, Dicæum mindanense, Phabotreron brevirostris.* The following species are figured with the *Challenger* reprint: *Loriculus panayensis, Batrachostomus septimus, Buceros mindanensis, Dicrurus striatus, Dicæum mindanense, Nectarophila juliæ, Phabotreron brevirostris.*

Tweeddale, Marquis of: [Letter relating to two species of *Batrachostomus* described by Mr. A. O. Hume.] *Ibis* (1877), IV, **1**, 388–392. Reprinted in Tweeddale's Ornith. Works (1881), 506–509.

The identity of *Batrachostomus affinis* Blyth is discussed.

Tweeddale, Marquis of: Description of four new species of birds from the Indian Region. *Ann. & Mag. Nat. Hist.* (1877), IV, **20**, 94–96. Reprinted in Tweeddale's Ornith. Works (1881), 509–510.

Three Philippine species described: *Megalurus ruficeps, Dicæum xanthopygium,* and *Oxycerca everetti.*

Tweeddale, Marquis of: On a new Philippine genus and species of bird. *Proc. Zoöl. Soc.* London (1878), 114, 115, pl. 9. Reprinted in Tweeddale's Ornith. Works (1881), 573, 574.

Dasycrotapha speciosa, new genus and species, described and figured.

Tweeddale, Marquis of: Notes on the Dicruridæ, and on their arrangement in the catalogue of the collection of the British Museum. *Ibis* (1878), IV, **2,** 69–84. Reprinted in Tweeddale's Ornith. Works (1881), 574–583.

Useful notes on the family *Dicruridæ* with some notes on the genus *Irena.*

Tweeddale, Marquis of: On a new species of the genus Buceros. *Proc. Zoöl. Soc.* London (1878), 277–280. Reprinted in Tweeddale's Ornith. Works (1881), 548–586.

Buceros semigaleatus, new species, described from Leyte; text figures of heads of *B. mindanensis* and *B. semigaleatus.*

Tweeddale, Marquis of: [Letter on the genus *Artamus.*] *Ibis* (1878), IV, **2,** 383–385. Reprinted in Tweeddale's Ornith. Works (1881), 625–627.

Maintains that the specific name *leucorhynchus* should be used for the Philippine swallow shrike.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. I. On the collection made by Mr. A. H. Everett in the Island of Luzon. *Proc. Zoöl. Soc.* London (1877), 686–703, pls. 72 & 73. Reprinted in Tweeddale's Ornith. Works (1881), 512–528.

A list of 86 species of which *Motacilla ocularis, Anthus maculatus,* and *Turnix fasciatus* are recorded as new to the Philippines; *Megalurus ruficeps, Oxycerca everetti,* and *Dicæum xanthopygium* are figured.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. II. On the collection made by Mr. A. H. Everett in the Island of Zebu. *Proc. Zoöl. Soc.* London (1877), 755–769, pls. 76 & 78. Reprinted in Tweeddale's Ornith. Works (1881), 529–543.

A list of 75 species of which *Hirundo javanica* and *Rallina eurizonoides* are recorded as new to the Philippines; the new species described are: *Zosterops everetti, Turnix nigrescens, Oriolus assimilis, Phyllornis flavipennis, Prionochilus quadricolor, Megapodius pusillus;* all of the new species except the first two are figured on the plates.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. III. On the collection made by Mr. A. H. Everett in the Island of Mindanao. *Proc. Zoöl. Soc.* (1877), 816–834, pls. 82–85. Reprinted in Tweeddale's Ornith. Works (1881), 543–561.

In this paper 43 species are added to the species known from Mindanao; *Cisticola greyi, Ægialitis cantianus,* and *Limnocinclus acuminatus* are recorded as new to the Philippines; *Loriculus hartlaubi, Mulleripicus fuliginosus, Criniger everetti,* and *Orthotomus nigriceps* are figured.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. IV. On the collection made by Mr. A. H. Everett in the Islands of Dinagat, Bazol, Nipah, and Sakuyok. *Proc. Zoöl. Soc.* London (1878), 106–114, pls. 6–8. Reprinted in Tweeddale's Ornith. Works (1881), 566–573.

A list of 39 species obtained in Dinagat and 13 species obtained in the small islands of Nipah, Bazol, and Sakuyok. The species figured are: *Ceyx argentata*, *Hypothymis cœlestis*, *Mixornis capitalis*, *Dicæum schistaceum*, *D. everetti*, and *Prionochilus olivaceus*.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. V. On the collection made by Mr. A. H. Everett in the Island of Negros. *Proc. Zoöl. Soc.* London (1878), 280–288. Reprinted in Tweeddale's Ornith. Works (1881), 586–594.

A list of 56 species, 24 of which are recorded from Negros for the first time and three, *Collocalia francica*, *Butalis latirostris*, and *Limosa ægocephala* are new to the Philippines. *Zosterops nigrorum* and *Macropygia eurycerca* are described as new species.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. VI. On the collection made by Mr. A. H. Everett in the Island of Leyte. *Proc. Zoöl. Soc.* London (1878), 339–346. Reprinted in Tweeddale's Ornith. Works (1881), 595–602.

A list of 67 species of which *Arachnothera flammifera* is new.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. VII. On the collection made by Mr. A. H. Everett in the Island of Panaon. *Proc. Zoöl. Soc.* London (1878), 379–381. Reprinted in Tweeddale's Ornith. Works (1881), 602–604.

A list of 20 species; *Dicæum modestum* is the only new species described in this paper.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. VIII. On some Luzon birds in the museum at Darmstadt. *Proc. Zoöl. Soc.* London (1878), 429–430, pl. 26. Reprinted in Tweeddale's Ornith. Works (1881), 604–606.

Notes on 8 species collected by von Othberg, and said to have come from the vicinity of Manila. The plate illustrates *Pitta kochi.* The other species listed are: *Collocalia fuciphaga*, *Turdus obscurus*, *T. chrysolaus*, *T. varius*, *Acrocephalus fasciolatus*, *Anthus gustavi*, and *A. maculatus*.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. IX. On the collection made by Mr. A. H. Everett in the Island of Palawan. *Proc. Zoöl. Soc.* London (1878), 611–624, pls. 37 & 38. Reprinted in Tweeddale's Ornith. Works (1881), 606–609.

A list of 52 species of which 32 were not obtained by Steere on his first visit to Palawan. The following new species are described: *Dicrurus palawanensis*, *Broderipus palawanensis*, *Drymocataphus cinereiceps*, *Brachypus cinereifrons*, *Criniger palawanensis*, *Corvus pusillus*, *Cyrtostomus aurora*, *Tiga everetti*, and *Trichostoma rufifrons*. The last two species are figured on the two plates.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. X. On the collection made by Mr. A. H. Everett in the Island of Bohol. *Proc. Zoöl. Soc.* London (1878), 708–712. Reprinted in Tweeddale's Ornith. Works (1881), 620–625.

A list of 47 species collected in northern Bohol of which *Cisticola cursitans*, *Alauda wattersi*, *Terekia cinerea*, *Limicola platyrhyncha*, *Limosa lapponica*, *Tringa albescens*, and *Strepsilas interpres* are recorded as new to the Philippines.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. XI. On the collection made by Mr. A. H. Everett at Zamboanga, in the Island of Mindanao. *Proc. Zoöl. Soc.* London (1878), 936–954, pls. 57–59. Reprinted in Tweeddale's Ornith. Works (1881), 627–645.

A list of 101 species of which 65 are recorded for the first time from Mindanao; of these *Accipiter stevensoni*, *Ninox lugubris*, *Coccystes coromandus*, *Cacomantis sepulchralis*, and *Ptilopus melanocephalus* are new to the Philippines and 6 are new to science; viz: *Pseudoptynx gurneyi*, *Ninox spilocephalus*, *Scops everetti*, *Chætura picina*, *Lyncornis mindanensis*. The species figured are: *Accipiter stevensoni Pseudoptynx gurneyi*, and *Chætura picina*.

Tweeddale, Marquis of: Contributions to the ornithology of the Philippines.—No. XII. On the collection made by Mr. A. H. Everett in the Island of Basilan. *Proc. Zoöl. Soc.* London (1879), 68–73. Reprinted in Tweeddale's Ornith. Works (1881), 645–651.

A list of 56 species of which 48 were not obtained by Steere. *Totanus calidris* was obtained in Basilan thus giving it a definite locality in the Philippines.

Ramsay, R. G. W.: The ornithological works of Arthur, Ninth Marquis of Tweeddale, (* * *) reprinted from the originals by the desire of his widow. Edited and revised by his nephew, Robert G. Wardlaw Ramsay, F. L. S., F. Z. S., M. B. O. U., captain 74th Highlanders (late 67th regiment) together with a biographical sketch of the author by William Howard Russell, LL. D. for private circulation. London (1881), i–lxiv and 1–651, appendix 653–676; index 677–760.

Includes reprints of the important papers on Philippine birds by Tweeddale, mostly from the Proceedings of the Zoölogical Society, of London, The Ibis, and The Annals and Magazine of Natural History, but without the plates. The appendix contains the important "Revised list of the birds known to occur in the Philippine Islands, showing their geographical distribution," compiled by Ramsay from the writings of Tweeddale and Sharpe.

Elera, Casto de: Catálogo sistemático de toda fauna de Filipinas conocida hasta el presente y á la vez el de la colección zoológica del museo de PP. dominicos del colegio-universidad de Santo Tomas de Manila escrito con motivo de la exposición regional filipina. Manila (1895), 1 (vertibrados), 52–398 (aves).

In the pages indicated Father Casto has listed all the birds known from the Archipelago and in addition all the species of birds represented in the